The American Journal of Surgery

VOLUME 100 OCTOBER 1960 NUMBER FOUR

EDITORIAL

Palliative Surgery for Advanced Malignancy

THE value of the so-called palliative surgical procedures in patients who are suffering from seemingly incurable malignancy has remained a debatable question in the minds of equally distinguished surgeons. Those who object are quick to point out the high mortality and excessive morbidity frequently encountered in the past. There is also the occasional instance of fulminating overgrowth of residual tumor leading to an early demise of the patient following operative intervention.

Those who advocate a more liberal operative approach object to allowing a correctable complication to persist even in those patients generally considered to be poor risks for surgery. They believe that the useful and perhaps pain-free days of life gained for the more fortunate few may more than justify the anticipated problems arising in the postoperative period. The controversy is a lively one and frequently takes on the semblance of a moral issue rather than a question to be debated and ultimately decided on a scientific basis.

In considering the evidence for and against each approach, it should be pointed out that the ultimate hazard to the patient is great in either event. The outcome is dependent not only on the site of origin, the type, and the speed of the growth of the malignant tumor but most often on the altered organ function or pathophysiology occurring secondary to mechanical obstruction from tumor growth. Preliminary treatment directed toward correcting the anemia, the reduced blood and plasma volume, the malnutrition, the dehydration and the imbalance electrolyte seen so frequently in these circumstances is an absolute prerequisite prior to determining operability for palliation. Failure of the patient to respond to such intensive therapy is, of course, just reason for avoiding what certainly will be a fatal operation.

Although absolute knowledge of an extensive and widespread growth with anticipated insurmountable technical difficulties is reason enough to decide against operation, one must be cautious in assuming this to be the situation without direct evidence. A simple cholecystojejunostomy to relieve an unrelenting and tormenting jaundice or an enteroenterostomy for a life endangering obstruction of the small bowel may add months and even years of useful life to these unfortunate people. Furthermore, a hurried and uncertain diagnosis of recurrent malignancy has been known to deter the surgeon from correcting what proved at postmortem to be a late complication of the original cancer operation, with no evidence of malignancy being found. In addition, there is increasing evidence of the validity of spontaneous regression of what seemingly was a hopeless malignancy, although, granted, this is rare.

Finally, the relentless searching of the thousands of trained investigators in our laboratories and in our teaching and research institutions is constantly bringing us closer to the day when all cancers may be controlled to some extent or perhaps cured. If this be the case, then let us take steps to assure that the greatest possible number of patients with cancer will still be on hand to benefit from the new knowledge.

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Observations on Mitral Valvular Commissurotomy

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WHEN mitral valvular commissurotomy was projected as the treatment of choice for patients with tight mitral stenosis a scant ten years ago, the standard approach to the valve was by way of the left auricular appendage, opening the commissures with the right index finger, at times supplemented by an instrument [1,6]. The limitations of this technic for creating an adequate lumen in every case have made it necessary that the surgeon be equipped to vary his procedure according to the problem at hand. In a series of over 350 consecutive operations for mitral stenosis at the Montefiore Hospital, performed by several members of the cardiovascular surgical group, several maneuvers have been adopted to meet this challenge.

LEFT THORACOTOMY

A left thoracotomy through a submammary incision is employed, with the left side of the patient moderately elevated from the true supine position, unless the patient has previously been operated on for mitral stenosis or if it is associated with an atrial septal defect. Depending on the configuration of the thoracic cage, the left pleural cavity is entered widely in the fourth or fifth intercostal space. Upon opening the pericardium one will encounter either: (a) usually, a left auricular appendage adequate to permit an operative approach; or (b) infrequently, a diminutive or obliterated appendage through which any surgical maneuver would be impossible or extremely hazardous. In the latter situation, rather than operating through a pulmonary vein or the left auricular wall, the surgeon closes the left pleural cavity with a water-seal drainage, and performs a right thoracotomy (see Right Thoracotomy).

When the left auricular appendage is ample, it is explored by the right index finger, after previously having placed a purse-string suture around the base and allowed clots to flush out as indicated. At this point the following three alternatives are available:

1. Finger fracture commissurotomy may be accomplished effectively. While the anterior commissure can usually be split adequately, with the surgeon standing at the left side of the patient, frequently it is awkward or impossible to open the posterior commissure from this position. When an adequate valvular orifice is not produced the surgeon should supplement his result by moving to the right side of the patient, or by introducing an instrument.

2. It has been found by Dr. Allan Bloomberg that the right index finger inserted in the left auricular appendage can be applied far more effectively to the posterior commissure if the surgeon stands at the patient's right side [3]. Because the anterior commissure can also be opened from this position, he has recently adopted this for the primary approach to the valve. Certain valves will not yield to either approach, because of elastic fibrosis or rigid calcification, and must be opened with an instrument.

3 The introduction of cutting instruments along the exploring finger in the left auricle has now been supplanted in our hands by insertion of a dilator through the apex of the left ventricle

and articulating its tip against the finger in the auricle, as described by Oeconomos [7] and Cooley et al. [4]. A short two-bladed aortic expanding dilator of the Brock type is suitable, and the resulting fracture can be tailored by the intra-auricular finger. Hemostasis at the site of ventriculotomy can be accomplished by tying a previously placed purse-string suture, or with interrupted sutures. Obviously this technic is admirably suited for the problem of combined aortic and mitral valvular stenosis, and has been employed successfully at this hospital.

At the conclusion of each of these left-sided procedures the auricular appendage is excluded by ligating or suturing its base and partial amputation.

RIGHT THORACOTOMY

The main disadvantages of the right-sided approach, as developed by Bailey et al. [2], are the inability to eliminate the left auricular appendage as a possible nidus of thrombus formation, and the inaccessibility of the left ventricle for introduction of a valvulotome. This technic, however, has been utilized by us, with gratifying results under the following two sets of circumstances:

1. Secondary operations for "restenosis." Whether the initial commissurotomy was inadequate, or stenosis recurred, once the left auricular appendage has been utilized, the approach of selection for the secondary procedure should be through the right lateral wall of the left atrium, after developing the interauricular groove. The valve may be brought slightly closer to the exploring finger by having the assistant push against the left lateral wall of the chest.

2. When primary left thoracotomy reveals an auricular appendage unsuitable for operative entry, the wound is closed, and the position of the patient shifted to a true supine, with slight elevation of the right hemithorax. A right submammary incision is made and the right pleural cavity entered in the fourth intercostal space. To date, eight patients have been subjected to this type of bilateral thoracotomy and mitral commissurotomy, leaving the sternum intact, without mortality or undue morbidity.

Almost all patients with mitral stenosis may be managed successfully with one of these closed technics, and with less risk than with the open heart methods currently available. A special indication for an open procedure exists when mitral stenosis and an auricular septal defect are both present. On February 12, 1959, both of these lesions were corrected simultaneously by Dr. Philip Glotzer in a desperately ill forty-five year old woman with intractable congestive heart failure and cardiac cirrhosis [3]. The patient had previously been subjected to an unsuccessful attempt at commissurotomy through the left auricular appendage. Exposure was obtained by a bilateral thoracotomy through both fourth interspaces, with transverse division of the sternum. Cardiopulmonary bypass was maintained by a bubble oxygenator of the DeWall-Lillehei type. Following a liberal right atriotomy, without cardiac arrest, the mitral valve was opened by working through the atrial septal defect, after which the atrial defect was closed. Rehabilitation of this patient was so marked that she was able to withstand an anterior resection for carcinoma of the rectosigmoid four months later, with an uneventful postoperative course.

The time may not be far distant when the open procedure will be employed more frequently, particularly in reoperations, or when the cardinal indication for surgery consists of peripheral emboli or auricular thrombosis.

COMMENTS

Regardless of which closed method is selected, the surgeon must be acutely aware of the hazard of occluding the stenotic mitral orifice too long with his exploring finger. Bradycardia and hypotension are followed quickly by arrhythmias and bizarre electrocardiographic complexes, and these may trigger irreversible changes leading to the patient's death. The position of the interauricular finger must be shifted quickly and repeatedly, until the orifice has been enlarged sufficiently to accommodate the finger and simultaneously allow blood to enter the left ventricle.

It is difficult to define the ideal commissurotomy. One attempts to open both commissures to the annulus, although a lesser degree of enlargement of the orifice will result in striking improvement. Unquestionably there are patients in whom the sudden conversion of a tight to a widely open valve results in such an abrupt change in dynamics that left ventricular failure and pulmonary edema are produced. In a discussion shortly before his death, Dr. Elliott Cutler considered this an important reason for some of the failures in his early series [5].

Unquestionably this hazard is increased by aortic valvular disease which may have been masked by the tight mitral stenosis. In all questionable cases the surgeon must be prepared to measure the gradient across the aortic valve, and to perform a concomitant transventricular aortic valvulotomy if a significant obstruction is disclosed.

Many cases in which secondary mitral commissurotomy is now being considered on the grounds of "restenosis" may, in fact, be the result of inadequate initial operations. Conversion from a tiny rigid orifice to a larger orifice at which the valve cusps are still motionless cannot be considered a good result. In one such recent case, a wide opening of the posterior commissure at a secondary procedure (from the right side) yielded a striking restoration of valve leaflet motion. In order to be able to offer the individual patient the best possible assurance of an adequate commissurotomy, primary or secondary, the surgeon must have a variety of technics at his disposal. A flexible approach embodying this principle is presented.

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Spigelian or Spontaneous Lateral Ventral Hernia

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THE purpose of the present article is to call attention to an infrequently reported hernia of the abdominal wall. An attempt will be made to show that these hernias are not rare and can easily be diagnosed.

A correct preoperative diagnosis stimulated our interest and made us aware of these hernias. This awareness and a more thorough abdominal examination made it possible to diagnose correctly eight additional cases in the subsequent three years. All cases have been substantiated by preoperative, operative and postoperative photographs. Three cases were also demonstrated by barium enema. This refinement is not always necessary but further confirms the preoperative diagnosis and adds to one's sense of personal satisfaction.

A spigelian or spontaneous lateral ventral hernia is one that occurs in the linea semilunaris. The linea semilunaris is a fibrous union of the rectus sheath with the fascia of the external oblique, internal oblique and transversus abdominis muscles. The line actually extends along the lateral border of the rectus muscle from the ninth costal margin to the pubic spine. A true spigelian hernia is one that occurs somewhere in the line above the inferior epigastric artery, thus eliminating direct inguinal hernia.

Most often the hernia is found at the level of the linea semicircularis [*1*]. This makes the location variable as the manner in which the aponeurosis of the internal oblique muscle fails to contribute to the posterior rectus sheath is inconstant. The defect is usually found at the junction of the middle and outer thirds of a line drawn from the umbilicus to the anterosuperior spine of the ilium [*1*]. It may vary in size from 0.5 to 2 cm., or larger. Larson [*2*] reported one measuring 6 cm.

The hernia penetrates the transversus aponeurosis and internal oblique muscle or its aponeurosis, and thus the sac consists of peritoneum and separated fibers of transversalis fascia and occasionally fibers from the internal oblique muscle. Seldom do these hernias penetrate the aponeurosis of the external oblique muscle but mushroom out beneath it. As a rule, the sac contains small bowel or omentum; less frequently, colon.

These hernias may be entirely asymptomatic, or they may become complicated by strangulation, incarceration, or adhesions. The adhesions are particularly prone to occur in the large hernias.

INCIDENCE

The disease is infrequently reported in the literature. Starting in 1919, Barthelemy could find only twenty cases. By 1952, there were 161 reported cases of pure spigelian hernia. The following list indicates the reported incidence [*1–16*]: 1919, 20 cases; 1941, 92; 1942, 116; 1951, 154; 1952, 161; 1953, 162; 1958, 183.

Cases listed through 1951 include those in the world literature. The additional cases listed from 1952 through 1958 include only those reported in the English literature plus our nine cases.

ETIOLOGY

No one has presented a completely satisfactory explanation of the cause of these hernias. Zimmerman, Anson, Morgan and McVay [*3*] have shown that the inferomedial extent of the internal oblique and transversus muscles is sometimes found to consist of interdigitating muscle bands separated by weak aponeurotic structures which are potential

hernial sites. In their series, 500 body halves were carefully studied for these defects. The width of the defects measured between 0.2 and 1.5 cm. Defects in the internal oblique muscle were found in 109 body halves, or 21.8 per cent. The transversus muscle was studied in 165 body halves, and defects were found in twenty-seven specimens. Both muscles were studied in 100 body halves with the following findings:

Defects	No. of Cases
In one or both layers	45
In internal oblique muscle alone	25
In transverse abdominal muscle alone	10
In both layers	10
Superimposed defects	6
Defect in transverse cephalad to that in internal oblique muscle	4
Total	100

The authors pointed out that the 6 per cent having superimposed defects would certainly be more likely to have parietal herniation. One specimen did show a hernia. Three operative cases were presented, and all showed findings similar to those in the anatomic laboratory.

Therefore, it is quite possible that these hernias may be due to the previously demonstrated congenital anatomic predisposition.

Others have believed that the weakness can be attributed to atrophy of portions of the internal oblique or transversus muscle with replacement by fatty tissue.

Cooper believed that the herniation escaped through tiny openings alongside blood vessels and nerves.

DIAGNOSIS

The diagnosis of this hernia is not difficult. An awareness of the condition is most important in enabling one to arrive at a diagnosis. As in other hernias, the contents may come and go, causing a variety of symptoms. These may include a vague history of intermittent mass, chronic burning or pulling pain, or an obvious incarceration.

We have found that the diagnosis can be made from a carefully taken history and a meticulous physical examination. Infrequently roentgenograms or other laboratory adjuncts will add much to a diagnosis in the small hernias, but the contents have been demonstrated radiographically in large hernias by obtaining a tangential view of the abdomen. The physical examination should be performed with the patient supine and erect, while at rest and while twisting and turning, thus contracting and relaxing the abdominal muscles while maintaining increased intra-abdominal pressure.

TREATMENT

Treatment offers no more of a perplexing problem than does any other herniorrhaphy. An anatomic repair is accomplished by reducing the contents, excising the sac and closing in layers.

CASE REPORTS

The paucity of reported cases justifies reporting nine additional cases. Eight cases were proved by operation or autopsy and the ninth by multiple examinations by more than one examiner.

CASE 1. R. C. (No. 235,044), a forty year old white man, was admitted to St. Mary's Hospital, Kansas City, Missouri, on September 29, 1954, for repair of a spigelian hernia in the left lower quadrant.

In August 1954, after heavy lifting, the patient was hospitalized at another hospital, complaining of fairly severe pain in the right lower quadrant. He was afebrile and had an elevated white blood count. There were no signs or symptoms to demonstrate intestinal obstruction. He was examined by a competent surgeon, and a specific diagnosis could not be made. The left semilunar hernia was found but was not thought to be the cause of the abdominal pain. The patient was observed for several days, and a barium enema was accomplished. The symptoms subsided with no specific treatment. The insurance company insisted that the hernia be repaired before the patient could return to work.

Examination of the abdomen showed a small, reducible hernia in the left semilunar line at the level of the anterosuperior iliac spine. There was a similar defect on the right side at the same level. There were no sensory changes.

On October 1, 1954, with the patient under general anesthesia, the bilateral spigelian hernias were repaired through separate transverse incisions. A normal appendix was removed through the right defect. The omentum was not seen, and as much as possible of the peritoneal cavity was examined through the small defects. Each defect measured about 2 cm. The transversalis fascia and internal oblique aponeurosis were closed separately with No. 2–0 silk sutures. The postoperative course was entirely satisfactory. The hernias have not re-

curred, and the patient has been free of abdominal symptoms for four years.

CASE II. J. M. E. (R-115 384), a forty-three year old white man, was admitted to Wadsworth V. A. Hospital on November 30, 1954, complaining of a recurrent, painful mass in the left lower quadrant of eight days' duration. The pain suddenly developed as the patient was unloading a truckload of storage batteries. Self-examination a few hours after the onset of the pain showed the presence of a mass. He was treated by a local physician who recommended bed rest, laxatives, enemas and narcotics. There was no nausea, vomiting or cramping pain.

For about ten years he had had recurrent episodes of nausea, vomiting and occasional abdominal cramps. The symptoms were not related to food intake and occurred at any time. He had been examined by army physicians during World War II and was told that he had a nervous stomach.

The work-up at this hospital confirmed the presence of an inconstant tender mass in the left lower quadrant measuring 2 by 2 cm. Proctoscopy, the basic laboratory work, and radiographic studies of the gastrointestinal and biliary tracts showed no abnormalities.

On December 15, 1954, with the patient under general anesthesia, a transverse incision was made in the left lower quadrant over the mass which was then on the level of the anterosuperior spine of the ilium. The external oblique aponeurosis was opened in the direction of its fibers, and a hernial sac was found. The sac was dissected free and opened. The defect measured about 1.5 cm. in diameter, and the upper and lateral borders consisted of the fold of Douglas. The sac was about 6 cm. in length. The peritoneum was closed with No. 3–0 silk purse-string suture. The herniorrhaphy was accomplished by closing in layers with interrupted No. 3–0 silk sutures. The postoperative course was uneventful, and he was discharged on the eighth postoperative day.

Several weeks later episodes of the previously described nausea, vomiting and abdominal pain again developed. On February 23, 1955, he was admitted to this hospital with the typical signs and symptoms of obstruction of the small bowel. The patient was prepared for surgery, and the peritoneal cavity entered through a right rectus incision. The findings consisted of turbid fluid in the peritoneal cavity, evidence of chronic obstruction of the jejunum and upper ileum, and an intact, non-involved herniorrhaphy site. The lower ileum was connected to the sigmoid colon by a flat thick band containing rather prominent blood vessels. This was the point of obstruction. The band was divided, ligated and transfixed. The ileum had folded upon itself and remained completely obstructed. Therefore, this segment was resected, and an end-to-end anastomosis was performed. The postoperative course was complicated by the development of a wound infection which responded to treatment. Later an incisional hernioplasty was successfully performed. The patient has remained symptom-free for four years. It is our opinion that the spigelian hernia was an incidental finding and that this man's basic disease was recurrent intestinal obstruction due to an adhesive band.

CASE III. P. C. H. (R-116 120), a sixty-five year old white man, was admitted to Wadsworth V. A. Hospital on February 14, 1955, with a hernia in the right lower quadrant of ten years' duration. There was no history of excessive straining nor trauma associated with the onset of the hernia. The hernia had been painful and had increased in size during the six months prior to admission. There had been no episodes suggestive of incarceration.

Examination showed a reducible hernia in the right lower quadrant. The hernia was about the size of a clenched fist and could be reduced with the patient erect or horizontal. The defect was about 2 cm. below the anterosuperior spine of the ilium. There was no evidence of inguinal hernias. A cholecystogram showed a poorly functioning gallbladder with multiple non-opaque stones. A barium enema showed a loop of terminal ileum in the hernial sac.

On February 25, 1955, with the patient under general anesthesia a herniorrhaphy was accomplished through a transverse skin incision. The external oblique aponeurosis was opened in the direction of its fibers. A large hernial sac was encountered, and this was dissected free from the surrounding tissue. The hernia presented lateral to the linea semilunaris, spreading the fibers of the internal oblique muscle. The sac measured 10 cm. in length, and the defect would admit three fingers. The hernia was reduced, the sac excised and the fascial layers imbricated.

Subsequently, the patient underwent an uneventful cholecystectomy, and abdominal exploration showed no other abnormalities.

CASE IV. O. C. C. (R-512 369), a thirty-seven year old white man, was admitted to Wadsworth V. A. Hospital on November 18, 1954, complaining of abdominal pain in the right lower quadrant. The pain had started six days prior to admission while the patient was scooping corn. The pain had remained more or less constant with occasional exacerbation. There was no radiation to the testis or back. The pain was not accompanied by nausea, vomiting, nor genitourinary symptoms.

Physical examination essentially revealed no abnormalities except for a tender mass measuring 2 by 2 cm. in the right semilunar line on the level of the anterosuperior iliac spine. Twenty-four hours after admission, the pain suddenly subsided, and it

FIG. 1A. Case v. Preoperative barium enema showing chronically incarcerated sigmoid colon in a spigelian hernia in the left lower quadrant.

was possible to palpate a small defect in the region of the previously described mass. In addition to the basic laboratory work, sigmoidoscopy and radiographic studies of the gastrointestinal and biliary tracts failed to show any abnormalities. The patient did not desire surgery.

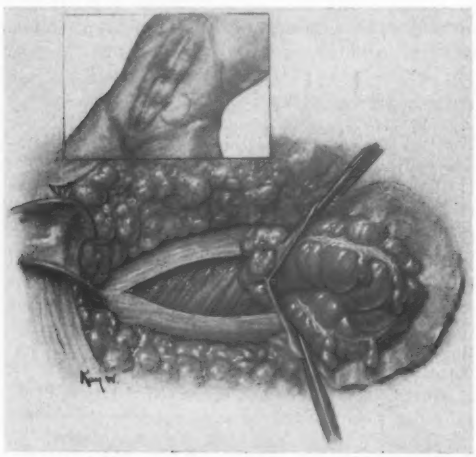


FIG. 1B. Case v. Drawing made from operative photograph. The anterior sheath has been incised showing the rectus muscle. The hernial sac, containing incarcerated sigmoid colon, is in the grasp of hemostats.

CASE V. F. M. D. (R-116 812), a sixty year old white man, was admitted to Wadsworth V. A. Hospital on April 12, 1955. On admission he was complaining of recurring episodes of precordial and interscapular pain of six months' duration. The pain was intermittent and often precipitated by exercise. There was a history of intolerance to fatty foods and one episode six months prior to admission suggestive of acute cholecystitis.

The patient had previously been hospitalized at this hospital in 1953 because of a ruptured appendix, peritonitis and mechanical obstruction of the small bowel. At that time it was noted that he had an old, circumscribed, non-reducible mass of grapefruit size in the left lower quadrant. The mass had been present since 1928.

Examination of the abdomen showed the following: (1) a transverse incision in the right lower quadrant complicated by a small, reducible, incisional hernia; (2) a non-reducible, chronically incarcerated spigelian hernia in the left lower quadrant; and (3) a pendulous and obese abdomen.

Basic laboratory studies and an upper gastrointestinal series showed no abnormalities. An electrocardiogram and a double master's two-step showed no evidence of coronary insufficiency. Two cholecystograms showed non-visualization of the gallbladder. A barium enema was reported as showing a hernia in the left lower quadrant containing sigmoid colon. (Fig. 1A.)

FIG. 1C. Case V. Postoperative barium enema showing reduction of hernia.

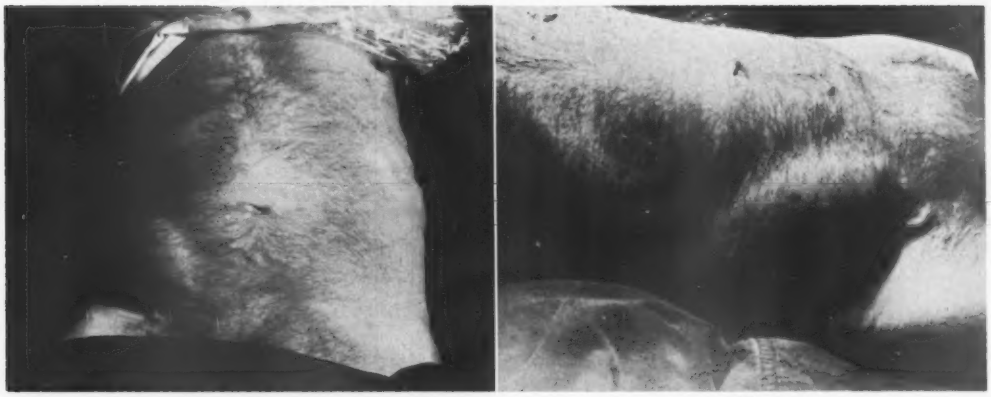
On April 29, 1955, with the patient under general anesthesia, cholecystectomy and spigelian herniorrhaphy of the left lower quadrant were accomplished. The findings at that time were as follows: (1) a chronically diseased, markedly contracted gallbladder containing multiple stones; and (2) a chronically incarcerated spigelian hernia in the left lower quadrant containing sigmoid colon. (Fig. 1B.) Herniorrhaphy was accomplished without difficulty through a transverse skin incision. The defect would admit two fingers. A repair was made by imbricating the fascial layers with interrupted silk sutures. The postoperative course was entirely satisfactory (Fig. 1C), and the patient was discharged on the eighth postoperative day. He has remained symptom-free.

CASE VI. J. G. C. (R-117 575), a sixty-one year old white, male physician, was admitted to the Wadsworth V. A. Hospital on June 16, 1955. About two months before admission the patient had lost about 2,000 cc. of bright red blood from the rectum. Diagnostic studies at that time had shown the presence of a sigmoid polyp, but the patient elected to defer a transcolonic polypectomy.

For the past six or seven years he had had occasional episodes of discomfort in the right lower quadrant, a sense of tightness, and "gas." These episodes were relieved by flexing the right thigh on the abdomen and massaging the right lower quadrant. An examination of the abdomen showed a thick, obese anterolateral abdominal wall. There was a defect in the right linea semilunaris just below the level of the anterior iliac spine. The defect would admit the tips of two examining fingers. A hernia could be palpated whenever the intra-abdominal pressure was increased.

On June 21, 1955, with the patient under spinal anesthesia, a transcolonic polypectomy was accomplished. Palpation of the anterolateral wall confirmed the diagnosis of a spigelian hernia in the right lower quadrant. The sac was empty at the time of surgery. No hernia was demonstrable in the left lower quadrant. The postoperative course was entirely satisfactory. The patient did not desire surgical closure of the defect.

CASE VII. H. W. B. (R-108 038), an eighty-two year old white man, was admitted to the Wadsworth V. A. Hospital on March 5, 1953. He was a patient on a medical ward primarily concerned with the custodial care of elderly, senile, chronically ill patients. Treatment was based upon diagnoses of (1) generalized arteriosclerosis; (2) arteriosclerotic heart disease; and (3) senile psychosis. For about three years he had had vague lower abdominal complaints. A barium enema in March 1953 was reported as unsatisfactory and not diagnostic. The enema did show spasticity of the descending colon and resulting moderate dilatation. Reference was made to the mass in the right lower quadrant, but this finding was not described in detail on the chart.



2A 2B

FIG. 2. Case VII. A, front view showing a large spigelian hernia in the right lower quadrant. B, side view.

Because of persistent lower abdominal complaints, abdominal distention, and the presence of a mass in the right lower quadrant, another barium enema was accomplished in December 1954. This study was reported as negative. On August 3, 1955, abdominal distention again developed, and the mass in the right lower quadrant was noted. The patient was seen in consultation by one of us on that date. The findings at that time were as follows: (1) an elderly white man in an oxygen tent whose condition was terminal due to generalized arteriosclerosis, arteriosclerotic heart disease with failure, and bronchopneumonia; and (2) a reducible, hernia in the right lower quadrant. (Figs. 2A and B.) The hernia was about the size of a half grapefruit and could be reduced through a defect which would admit three fingers. The defect was in the right linea semilunaris just below the level of the anterior iliac spine. A diagnosis of spigelian hernia of the right lower quadrant was made, and no surgery was recommended. The patient died on August 6, 1955. The autopsy showed the following: (1) pulmonary fibrosis and emphysema with bronchopneumonia; (2) cardiac hypertrophy and myocardial fibrosis; (3) generalized arteriosclerosis; (4) senile arteriosclerotic kidneys; (5) carcinoma of the splenic flexure; (6) carcinoma of the prostate; and (7) multiple petechial hemorrhages in the brain; mild cystic encephalomalacia of the right hemisphere. The abdomen showed a large defect in the right linea semilunaris at the fold of Douglas. The defect would admit three fingers. The hernial sac contained several loops of small bowel.

CASE VIII. P. D. H. (R-119 542), a seventy-seven year old white man, entered the Wadsworth V. A. Hospital on December 9, 1955, complaining of a right inguinal hernia of ten years' duration. He also had an intolerance of fatty foods and a moderate amount of substernal distress on reclining. Examination of the abdomen showed a non-reducible spigelian hernia in the left lower quadrant. There was a reducible right inguinal hernia. The basic laboratory work was within normal limits. Barium enema showed diverticulosis of the sigmoid and involvement of the sigmoid in a spigelian hernia. A cholecystogram showed a non-functioning gallbladder and cholelithiasis.

On December 22, 1955, with the patient under general anesthesia the spigelian hernia was repaired. The hernial sac contained incarcerated sigmoid colon. The transversalis fascia, internal and external oblique aponeuroses were closed in layers by imbricating with interrupted No. 2–0 silk sutures. The postoperative course was entirely satisfactory.

Subsequently the right inguinal hernia was repaired without incident. The patient did not desire cholecystectomy.

CASE IX. J. J. B. (R-121 797), a seventy-six year old white man, was admitted to the Wadsworth V. A. Hospital on July 13, 1956, complaining of a left inguinal hernia of one year's duration. He had also noticed a similar bulge in the right lower quadrant. The left hernia was painful, but there had been no episodes of incarceration. With the exception of chronic constipation, he had had no significant gastrointestinal tract symptoms. Examination of the abdomen showed bilateral, reducible hernias in the lower quadrant. Both hernias were on a level just below the anterosuperior iliac spines. There were no inguinal hernias. The basic laboratory work and a barium enema showed no abnormalities.

On August 9, 1956, with the patient under spinal anesthesia, the left spigelian hernia was repaired. The hernial sac was found in the linea semilunaris at the fold of Douglas. The defect would admit two fingers, and the sac measured 7.5 cm. in length. The ileohypogastric nerve and the inferior

epigastric vessels were medial to the sac. The sac made its exit between two bands of internal oblique muscle. Imbrication of the transversalis fascia and transverse abdominal aponeurosis resulted in a satisfactory repair. The postoperative course was entirely satisfactory.

On September 6, 1956, with the patient under spinal anesthesia, the right spigelian hernia was repaired. The findings were essentially the same as on the left side, and the repair was accomplished in like manner. Again the postoperative course was satisfactory.

COMMENTS

Remembering that these hernias are usually interparietal, it can be seen that a history of pain in the right or left lower quadrant and the inconstant presence in different locations of a mass can be real and not imaginary. These symptoms should make one especially careful in the abdominal examination. Fascial defects may be palpated if one examines the linea semilunaris in different postures with different sets of muscles in play. Even though a defect is not definite, a small, tender herniation may be found by making a thorough examination. A variety of other anterior and lateral abdominal wall conditions may also be revealed if the examiner considers other than intra-abdominal disease as the cause of certain signs and symptoms. Among these conditions are hemorrhage into and beneath the rectus muscle and tumors of the anterior abdominal wall [9].

The importance of a history of forceful muscular activity is difficult to evaluate. In Cases I, II and IV the onset of symptoms was associated with heavy lifting. The remaining patients attributed no particular symptoms to the hernia other than vague discomfort or tenderness on palpation.

The barium enema was instrumental in making or confirming the diagnoses in Cases III, V and VIII. The barium study was particularly helpful in Case V as the patient was obese, and the hernia was chronically incarcerated.

In Cases II, III, V, VI and VIII associated intra-abdominal disease was present which was proved at subsequent surgery. Most symptoms could be attributed to the associated disease instead of the hernias.

It is thought that the major pitfall in the diagnosis of this type of hernia is the fact that it is almost purely a clinical one. However, radiographic studies are sometimes of value as pointed out in Cases III, V and VIII.

SUMMARY AND CONCLUSIONS

The subject of spontaneous lateral ventral hernia has been briefly reviewed.

Nine additional cases observed over a period of three years are added to the literature. The condition is probably not too rare, and the diagnosis is missed all too often. The failure to make the diagnosis may be due to: (1) unawareness of the hernia, and (2) failure to perform adequately the abdominal examination.

Barium enemas have been shown to be of definite diagnostic value in selected cases.

Congenital defects at the site of the interdigitation of the internal oblique and transversus abdominis muscles appear to be important etiologic factors.

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Carcinosarcoma of the Uterus

A REVIEW OF THE LITERATURE AND REPORT OF FOUR NEW CASES

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CARCINOSARCOMA of the uterus is a rare malignant tumor of the endometrium containing both carcinomatous and sarcomatous elements. (Figs. 2 and 3.) Not only does the medical profession generally lack knowledge of such tumors, but also some have doubted their existence. The exact number of cases reported has never been definitely determined. Many of the cases have not been reported, and the authenticity of some that have been reported has been questioned. According to Piquand [1], one in every 7,500 malignant tumors of the body of the uterus is a mixed tumor. Sternberg et al. [2] found twenty-one cases of carcinosarcoma among 26,114 patients with gynecologic problems admitted to the Charity Hospital of Louisiana during a period of six years, a frequency of 0.08 per cent. In a comprehensive review of the literature, Hoffstätter [3] (1953) found more than sixty "certain cases" of carcinosarcoma of the uterus. However, Symmonds and Dockerty [4], as recently as 1955, recorded seven cases from the literature and reported nine from the Mayo Clinic. They made the following statement, "No longer is it justifiable to question the existence of malignant uterine tumors containing tissues with the characteristics of both carcinoma and sarcoma." The last report of sixteen additional "proven" cases of carcinosarcoma of the uterus was made by Wolfe and Pedowitz [5] in 1958.

In order to stimulate further the study and understanding of the subject of carcinosarcoma of the uterus, the literature is briefly summarized, and four new authentic cases are reported from the Jewish Chronic Disease Hospital.

Meyer [6] classified carcinosarcoma of the uterus as *combination tumors*, true teratomas with malignant transformation of both epithelial and mesodermal tissue (striated muscle, osteoid tissue, cartilage and fat); *composition tumors*, in which a sarcomatous change has taken place in the stroma of a carcinoma, or the reverse; and *collision tumors*, a coalescence of separate and independent carcinoma and sarcoma.

Almost all of the patients reported on in the literature had passed the menopause and were over fifty years of age before the development of symptoms. A great number of them were between fifty-five and sixty-five years old. Sternberg et al. reported three such tumors in children. The youngest was one year old. Seventeen of their twenty-one patients were Negroes, including the three children. (The ratio of Negro to white patients admitted to the gynecological service at Charity Hospital was approximately 2:1.) A number of the patients had received intrauterine radium for functional vaginal bleeding or some benign condition, usually ten or more years before the diagnosis of carcinosarcoma was made. In fact, some doctors still use intrauterine radium for vaginal bleeding as a routine, with and without diagnostic curettage, before the malignancy has been histologically proven. Some authors find a causal relationship between the development of carcinosarcoma and the previous intrauterine radiation for a non-malignant condition. According to Hill and Miller [7], "If there is a direct relationship, as suggested by the high percentage of these patients having received irradiation, the frequency of carcinosarcoma may be expected to show an increase in the next several years as a result of the widespread use of radiotherapy during the 1930's for presumed functional uterine bleeding." Ten cases of carcinosarcoma of the uterus were associated with uterine fibroids. Carpas and Speer [8] reported a case of carcinosarcoma of the endometrium in a patient who had received estrogen therapy for eleven years.

The symptoms and signs of carcinosarcoma of the uterus, as summarized from the literature, are characterized by irregular vaginal bleeding preceded by vaginal discharge, either purulent or otherwise. The bleeding may become so profuse that the patient requires blood transfusions. The source of the bleeding is multiple polypoid masses attached to the anterior or posterior wall of the endometrium, protruding in many instances from the external os of the cervix into the vagina, or protruding outside of the vagina. (Fig. 1.) Of thirty-six cases of uterine carcinosarcoma collected from the literature by Saphir and Vas [9], nineteen had pedunculated tumors projecting either from the endometrium into the uterine cavity or from the cervix into the vagina. They consist of fragile, necrotic tissue which bleeds profusely at the least manipulation. The cervix may be equally fragile and necrotic. Liza et al. [10] reported a case of carcinosarcoma of the uterus in which the cervix was so friable that it tore loose from the uterus during hysterectomy.

Before long the pelvis becomes filled to the brim with multiple tumor masses which extend above the symphysis pubis. Pressure symptoms of pain, urinary and rectal disturbances, and edema of the lower extremities may ensue. Eventually the whole abdomen is filled with multiple tumor masses and ascitic fluid. A nodular liver may be palpated several fingers below the costal margin.

Metastasis, usually hematogenous, is either a pure carcinoma or pure sarcoma. Only four cases of combined metastasis are reported in the literature. Local recurrence and regional metastasis, infiltrating the bladder, parametrium, vagina and perineum are frequent. (Case 1, Fig. 1.) Metastasis to lymph nodes is infrequent. However, metastasis to the peritoneum, mesentery, liver, lungs and pleura is not uncommon. Pleural and pulmonary metastasis is usually associated with pleural effusion. Skeletal and brain involvement are extremely rare. Dixon and Dockerty [11] reported a case of widespread skeletal metastasis in which a tumor mass in the thoracic spine, compressing the spinal cord, resulted in transverse myelitis. One of our patients (Case II) had metastasis to the brain.

The treatment of choice for carcinosarcoma of the uterus is early total hysterectomy and bilateral salpingo-oophorectomy. The tumor is radioresistant. However, one would hesitate to deprive a patient with carcinosarcoma of postoperative radiotherapy when the metastasis might be a pure carcinoma, since the latter is radiosensitive. According to Hill and Miller [7] "therapy is restricted to radical hysterectomy, since no cases have shown any significant response even to heavy irradiation." Unfortunately, the disease is resistant to any form of treatment.

The prognosis is so poor that the average survival is from six to twelve months after the diagnosis is established. Hill and Miller and others report that there is no five-year survival; however, exceptions in the survival rate may be found in any malignancy, no matter how fatal, depending on the host resistance or immune reaction to cancer [12]. Chesky et al. [13] reported a case of nine years' survival and cited another by Camporo that survived four and a half years. Boschann [14] reported a case of ten years' survival in 1954.

CASE REPORTS

CASE 1. I. D., a fifty-eight year old Negro woman, was admitted to the Jewish Chronic Disease Hospital on August 14, 1958, with a diagnosis of carcinosarcoma of the uterus with general abdominal and pulmonary metastasis. The diagnosis was based on multiple biopsy specimens taken from the uterine fundus, cervix and vagina at the New York Hospital. The slides were examined by Dr. F. W. Stewart and Dr. F. W. Foote of Memorial Hospital, New York City.

The patient first menstruated at the age of thirteen. Periods were always regular with a cycle of twenty-eight days and lasted four days. She was Para VIII, gravida IX. Her menopause occurred at the age of forty. About six months previous to admission she had a sudden gush of dark red blood from the vagina. She was treated by a local physician with "injections" and a vaginal examination had not been performed. The bleeding subsided in three to four days. She then received another series of "injections to kill her appetite" and was placed on a very strict diet. In a very short time the patient lost 40 pounds. When suprapubic pain and urinary disturbance developed, the patient was brought to the hospital for admission. After a complete study, she was transferred to our institution for supportive treatment.

Physical findings on admission revealed that the pelvis was filled by a large, firm, fixed mass extending to about two fingers below the umbilicus. A fungating, bleeding necrotic mass protruded from the cervix and vagina. The vaginal wall was indurated and nodular. The fundus was fixed and "frozen" within the pelvis. Her hemoglobin was 5.7 gm. per cent. Roentgenograms of the chest

FIG. 1. Case I. Carcinosarcoma of the uterus with protrusion of polypoid mass from the cervix outside of the vagina, and metastatic involvement of the vagina and perineum is shown.

revealed pulmonary metastasis. Skeletal survey was pathologically negative.

The patient was given blood transfusions followed by x-ray therapy and radium was inserted into the vagina. Vaginal bleeding stopped. She was discharged as improved, after a fifty-five-day stay in the hospital.

She was readmitted a month later with recurring vaginal bleeding. At this time the vaginal mass had increased greatly and involved the bladder, urethra and perineum. (Fig. 1.) Intravenous pyelogram showed a non-functioning left kidney, hydronephrosis and hydroureter on the right side. Both lungs were involved with metastasis. She was given several blood transfusions and another course of x-ray therapy to arrest the bleeding. On the twenty-fifth day of her second admission a high, spiking temperature developed. Her respirations became labored and she died of bronchopneumonia the next day (November 19, 1958), nine months after the onset of symptoms.

Summary of the findings at autopsy: Gross and microscopic examination showed primary anaplastic carcinosarcoma of the uterus with metastasis to the lungs, mediastinum, pleura, peritoneum, diaphragm, small and large intestines, omentum, mesentery, pelvis, vagina, vulva, lymph nodes, left adrenal and gallbladder. Examination of both kidneys revealed acute suppurative pyelonephritis, bilateral pyonephrosis and pyoureters. The examination of the lungs showed bronchopneumonia. The other findings were fatty metamorphosis, cholelithiasis, chronic cholecystitis, fibrosis of the myocardium and toxic splenitis.

CASE II. F. L., a sixty-nine year old Jewish woman, was admitted to the Jewish Chronic Disease Hospital on January 25, 1957, with a diagnosis of carcinosarcoma of the uterus. The diagnosis was confirmed at our institution.

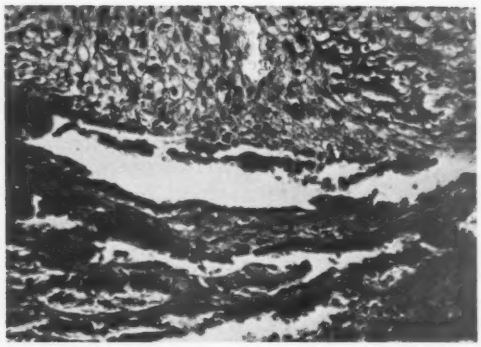

FIG. 2. Case II. Photomicrograph showing carcinomatous and sarcomatous elements in carcinosarcoma of the endometrium. Original magnification × 250.

In November 1955 she had a yellowish, foul vaginal discharge. By February 1956 the discharge had become sanguineous, and she had lower abdominal pain with distention. She was admitted to a hospital on July 24, 1956, where a diagnostic curettage revealed the presence of carcinosarcoma of the uterus of the mixed mesenchymal type. She received 6,000 mg. hours of intrauterine radium, followed by a total hysterectomy and bilateral salpingo-oophorectomy on August 1, 1956. The pathological report was carcinosarcoma, mixed mesenchymal type, with necrosis of the endometrium and endocervical mucosa, and metastasis to the ovaries and omentum. (Fig. 2.) She did well until the middle of December when diplopia, aphasia, disturbed speech, convulsive seizures and vomiting occurred. She became bedridden and lost the use of her limbs. She was then transferred to our institution.

Her abdomen was enlarged, with palpable intra-abdominal tumors and fluid. The liver extended to two fingers below the costal margin. Roentgenogram revealed right pleural effusion and left pulmonary metastasis. Pneumoencephalogram and electroencephalogram were interpreted as showing signs of metastasis to the brain. A skeletal survey failed to reveal metastasis to the bone.

She received a course of radiation, blood transfusions, and other supportive measures, but became progressively worse and died on June 24, 1957, nineteen months after the onset of symptoms. Consent for autopsy could not be obtained.

CASE III. I. Y., a sixty-four year old Jewish woman, was admitted to the Jewish Chronic Disease Hospital on November 1, 1956, with a diagnosis of carcinosarcoma of the uterus. The diagnosis was confirmed at our institution.

The woman was P 0 a v, gravida vii. Her menstrual history was uneventful until she was forty-nine years of age when excessive vaginal bleeding developed, for which she had a dilatation and curettage and insertion of radium. The bleeding subsided for fifteen years until her first admission to a hospital on August 29, 1956, for postmenopausal bleeding, abdominal pain and distention. A diagnostic dilatation and curettage and laparotomy revealed a malignant tumor of the uterus with a "frozen" pelvis and a partial intestinal obstruction. A segment of the small intestine had to be resected and a transverse colostomy performed. The uterine curettings proved to be carcinosarcoma. (Fig. 3.) The patient was subsequently transferred to our institution after receiving 5,000 mg. hours of intrauterine radium.

Examination revealed an undernourished, pale woman. She complained of abdominal pain. The abdomen was enlarged, with a large, firm mass extending from the pelvis toward the umbilicus. This was further confirmed by vaginal and rectal examination. The cervix was small and friable. The liver and spleen were not enlarged. Both lower extremities were markedly edematous.

A skeletal survey revealed no evidence of metastasis to the bones. Roentgenograms of the chest were negative for metastasis. A gastrointestinal series showed fixation of loops of intestine to the pelvic mass and angulation of jejunal loops by external pressure of abdominal masses. Intra-abdominal fluid was visualized. The intravenous pyelogram was reported to be negative for metastasis.

The patient received blood transfusions, radiotherapy to the pelvis and other supportive treatment. She died on July 8, 1957, eleven months after the onset of symptoms. Consent for autopsy could not be obtained.

Case iv. R. F., a fifty-two year old Jewish woman, was admitted to the Jewish Chronic Disease Hospital on July 14, 1958, with a postoperative diagnosis of carcinosarcoma of the uterus with general metastasis. Through the courtesy of Dr. Samuel Weiner of St. John's Hospital, Brooklyn, New York, the diagnosis of carcinosarcoma (collision tumor) was confirmed by Dr. Samuel A. Wolfe of the State University of New York, Downstate Medical Center and Dr. Arthur Hertig of Harvard Medical School.

The patient had a normal menstrual history. She was married at the age of twenty-four, had two normal pregnancies and deliveries and one incomplete abortion. She had an uneventful menopause in 1953. In February 1958 she had her first episode of postmenopausal bleeding associated with suprapubic pain. Her uterus was enlarged to the level of the umbilicus. Bleeding, necrotic, polypoid-like tissue protruded from the cervix. The patient was admitted to a hospital and total abdominal hysterectomy with bilateral salpingo-oophorectomy was performed. The pathological diagnosis was carcinosarcoma.

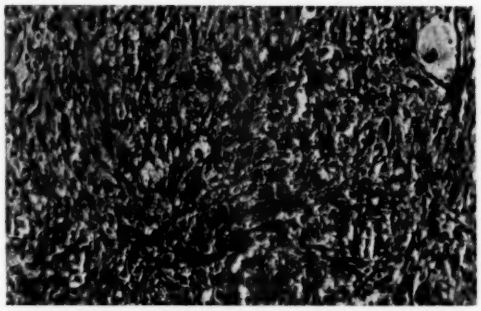

Fig. 3. Case iii. Photomicrograph showing carcinomatous and sarcomatous elements in carcinosarcoma of the endometrium. Original magnification × 250.

Six weeks later she had a sanguineous, foul vaginal discharge, followed by intermittent vaginal bleeding. Recurrence of the malignancy was found in the vaginal vault.

On June 12, 1958, she was admitted to a municipal hospital where she received fifty x-ray treatments followed by an exploratory laparotomy which revealed abdominal metastasis and also metastasis to the urinary bladder. A partial exenteration of the bladder was performed and an ileal bladder created. The patient was subsequently transferred to our institution.

Examination of the patient at the Jewish Chronic Disease Hospital revealed a chronically ill, emaciated, anemic woman. Her abdomen was distended with fluid, and multiple tumor masses could be palpated throughout the abdomen. The liver was enlarged to about four fingers below the costal margin. The vagina, which was filled with blood and necrotic tissue, admitted only one finger and bled at the least manipulation. The lower extremities were edematous. A gastrointestinal series showed multiple intra-abdominal tumors displacing the stomach and intestines. A roentgenogram of the chest revealed pulmonary metastasis with pleural effusion. Pyelogram showed bilateral hydronephrosis. The skeletal survey was negative for metastasis.

The patient was given supportive treatment consisting of blood transfusions, intravenous fluid, high caloric and high vitamin diet and sedatives. She died on February 22, 1959, one year after the onset of symptoms. Autopsy consent could not be obtained.

SUMMARY

Carcinosarcoma of the uterus is a rare malignant tumor of the endometrium containing both carcinomatous and sarcomatous elements. Almost all the patients had passed their meno-

pause and their fiftieth birthday. A number of them had received intrauterine radium for functional vaginal bleeding or benign neoplasm ten or more years previously. A causal relationship may exist between the development of carcinosarcoma and previous intrauterine irradiation for a non-malignant condition. Physical findings, treatment and prognosis are discussed briefly. Four new cases of carcinosarcoma of the uterus are reported from the Jewish Chronic Disease Hospital.

CONCLUSION

Carcinosarcoma should be considered in postmenopausal bleeding, especially when there is a protrusion of polypoid tissue from the cervix or vagina. Radiation therapy should be restricted to malignant conditions of the uterus when indicated. Early total hysterectomy and bilateral salpingo-oophorectomy is the treatment of choice in operable cases of carcinosarcoma of the uterus. It is hoped that this paper will further stimulate the study of carcinosarcoma of the uterus and thus improve the prognosis.

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Significance of Vesicoureteral Reflux

ANALYSIS OF 100 CYSTOGRAMS IN PARAPLEGICS

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DESPITE considerable research with vesicoureteral reflux (VUR), there remains a great deal of controversy regarding its significance, etiology and therapy. Most authors agree that in patients with paraplegia VUR is an important factor in producing a dilatation of the upper urinary tract; when combined with infection, irreversible parenchymal destruction is accelerated leading to renal insufficiency.

A competent ureterovesical valve produced by the oblique course of the elastic and collapsible intravesical ureter, plus the normal sustained contraction of the ureteral and vesical musculature tend to prevent the reflux. Any pathologic lesion which produced incompetency of the ureterovesical valve, and especially if associated with an increased vesical pressure [5], will greatly enhance a VUR.

The exact cause of VUR is unknown. Hutch [7] attributes incompetency of the vesicoureteral valve to a thinned, chronically inflamed, trabeculated bladder which has resulted in a herniation phenomenon of the ureteral intramural portion. Chronic inflammatory involvement of the ureteral orifice subsequently produces a fibrotic gaping with subsequent incompetency, allowing the contents of the bladder to pass upward toward the kidneys. This has been considered an important factor during the late stages of urinary involvement. The direct effect of the nerve lesion is of questionable importance [9]. None of these factors account for every case of VUR. On rare occasions, VUR appears in the absence of any demonstrable genitourinary disease. It is possible that the combination of both inflammation and thinning of the wall of the bladder results in marked distortion of the ureteral valve and disturbance of the normal physiologic activity.

In a review of the combined statistics by various authors consisting of 1,886 cases of paraplegia, VUR was reported in 298, an incidence of 15.8 per cent. The VUR was more predominant in the upper motor lesion and on the right side [3]. The incidence of VUR increases after the third year of injury.

Patients without paraplegia have a lower incidence of VUR. In a collection of 2,099 cases, VUR appeared in 219 patients (10.4 per cent). This compares with an incidence of 13 per cent in infants and children.

This phenomena is simply the extension of dye to the upper urinary tract during a cystogram and is not a pathologic entity in itself; rather, it denotes disturbance of the normal physiology by some other process. It may only appear temporarily during a cystographic examination or will vary with each test, depending upon the technic used.

The height of the container with the distending fluid, position of the patient, length of time the procedure is followed, and the voiding examination are all important factors. A slow rate of flow of the distending media is more conducive to an appearance of the reflux. The degree of distention of the bladder has no relation. The type of anesthesia may influence the occurrence of the phenomenon. Spinal anesthesia tends to produce a VUR. General anesthesia may result in its disappearance.

The presence of bilateral hydroureter associated with a trabeculated bladder may suggest the entity, but only by a cystogram revealing a reflux can VUR be diagnosed. Consequently, a series of cystograms are of more value in establishing its presence. Delayed cystography [12], squat-shot dorsal views and postvoiding

films are useful in ascertaining a reflux. Fluoroscopy may reveal a temporary VUR. VUR should be combined with cystoscopy, determination of residual urine, intravenous pyelogram, urinalysis and renal function tests to produce a complete clinical picture of the patient's urologic status. VUR should be evaluated with cystoscopy, determination of residual urines, intravenous pyelogram, urinalyses, urine cultures and renal function tests to ascertain the patient's urologic status and as a guide for future course of action.

VUR without associated obstruction of the neck of the bladder is not an indication for surgical intervention. In patients with well balanced bladder function, conservative treatment and watchful expectancy are the procedures of choice. Patients with paraplegia and irreversible VUR should have continued catheter drainage. Surgical intervention is indicated when progressive and irreversible changes of the upper urinary tract are evident [*13*].

The type of surgery will depend on the pathologic site. Transurethral resection or suprapubic cystotomy should be utilized to alleviate obstruction at the neck of the bladder. Various types of urinary diversion operations and plastic procedures [*4*] have been performed in an attempt to correct disease proximal to the bladder. None have been completely successful. Strictures, reflux, infection, and dilatation of the upper urinary tract have left much to be desired during the late stages. Ureteral diversion into the intact bowel is not feasible in the patient with paraplegia with an involuntary state and poor skin turgor. It is possible that the Hutch vesicoureteroplasty [*7,14*] and the Bricker ileal shunt procedures may alleviate these difficulties in the future.

Rhizotomies and sacral neurotomies may produce an improvement in selected patients [*1*], but are essentially mutilating operations on the nervous system. The time element during which these procedures alleviate the condition is variable. At the present time, the number of cases reported is too small to make a definite evaluation.

MATERIAL

The consecutive cystograms of 100 male patients with injuries of the spinal cord performed at the Veterans Administration Hospital between May 1957 and February 1958 were carefully reviewed. Only patients with unequivocal levels of injuries of the spinal cord and grossly impaired motor function were included. Patients with associated cerebral trauma or pre-existing diseases of the central nervous system, such as multiple sclerosis, were omitted from this study. Patients' ages at the time films were taken varied from eighteen to seventy years. The time interval from injury ranged from three weeks to 15 years. Predominant causes of trauma were car accidents (36 per cent), gunshot wounds (25 per cent), falls (14 per cent), and diving accidents (12 per cent).

The technic of cystograms was uniform as they were taken by the same team, using a standardized procedure. No anesthesia was used. The bladders were filled with sodium hippuran (48 per cent) by means of gravity, elevating the funnel as high as the catheter would permit. Prior to instillation, a flat plate was obtained and after filling the bladder, anteroposterior and oblique views were taken. The anteroposterior view was repeated in twenty minutes. Voiding cystograms were not included in this study because of the paralyzed bladder situation.

RESULTS

VUR was found in sixteen patients (16 per cent). It was unilateral in nine; five on the left side and four on the right. The contrast material appeared only in the ureter in three-fourths of the patients. Only 42 per cent of the patients exhibited irregularity of the bladder on the films, indicating heavy trabeculation and cellule formation. None of the patients with VUR had roentgenographic evidence of vesical calculi although an incidence of 9 per cent was noted in the entire series. It is apparent from Figure 1 which summarizes the results, that the relative incidence of VUR was markedly increased in cystorgrams taken ten or more years following injury of the spinal cord. The highest incidence of VUR occurred in middle-aged patients with injuries of the cervical spinal cord which occurred over ten years previously. VUR was found in one of nineteen patients over forty years of age. In agreement with other investigators, the VUR's were less common in patients with injuries at lower levels, only one of seventeen patients in this group having a unilateral reflux. This patient presented with the only evidence of the intramural ureteral herniation phenomenon. None of the patients with VUR

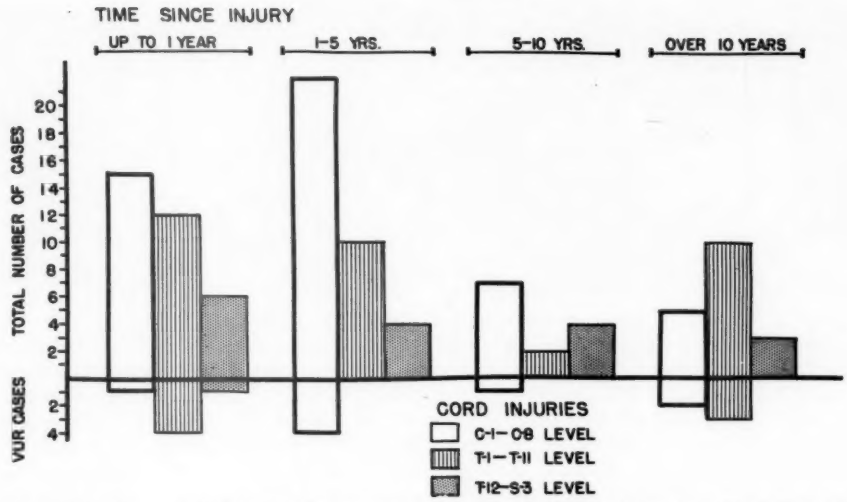

FIG. 1. Incidence of VUR in various groups in patients with level and duration of injury of the spinal cord.

had a gaping type ureteral orifice on cystoscopic examination.

SUMMARY

A brief review of the literature on VUR is presented associated with data on cystograms of 100 patients with injuries of the spinal cord. The incidence of VUR is 16 per cent. Marked trabeculation of the bladder is not essential for this occurrence since it was exhibited in only about half the patients. Injuries of proximal portion of the spinal cord and their long-standing appear to predispose the development of VUR. One instance of the intramural ureteral herniation phenomenon was found. No evidence of contracture of the fibrotic ureteral orifice was encountered in our series.

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Carcinoma of the Palate

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CANCER of the palate is not commonly seen in North America and epidermoid carcinoma of the hard palate is stated to be very rare in current textbooks [1] on cancer.

In a series consisting of approximately five thousand cases of malignant tumors of the oral cavity seen at the Mayo Clinic from 1907 to 1938, New and Hallberg [5] reported that there were only twenty-five cases of epidermoid carcinoma of the hard palate.

Martin's [4] figures from Memorial Cancer Hospital in New York are typical of those of North American medical centers. He states that 90 per cent of the palatal cancers occurred in men, the majority of these cancers were adenocarcinomas, and the growth originated on the soft palate in 73 per cent of the patients.

It is the purpose of this paper to (1) report the strikingly different features of this disease as seen in Panama; (2) cite the clinical association of chronic irritation and tobacco with epidermoid carcinoma of the palate; and (3) make a preliminary report on its treatment in this area since 1954.

Since 1954 I have personally been consulted by fourteen patients with cancer of the palate. Only one was male, a North American, Canal Zone employee, whose tumor originated on the soft palate. The remaining thirteen patients were Panamanian women, in each of whom the tumor originated primarily on the hard palate and was an epidermoid carcinoma. All of these women had smoked rolled tobacco leaves or small cigars with the lit end within the mouth and against the palate for many years.

Kini and Subba Rao [3] in 1937 reported this habit of "reverse smoking" with rolled dry tobacco leaves in India and its association with palatal cancer. They found fifty-two cases of cancer of the palate in a series of 335 oral cancers.

In India the practice of "Adda Poga" or reverse smoking is indulged in by both men and women while in Panama the habit is mostly confined to women from the Interior. Lack of money to buy manufactured cigarettes and possibly the desire to conceal the fact that they smoke may have been factors in the origin of this habit and its practice by the women from the Interior of Panama.

To the credit of these persons, it must be admitted that smoking in this manner utilizes more efficiently all the nicotine and tars in the weed; however, a high incidence of epidermoid carcinoma developing in the area of mucosal irritation by the lit end of the tobacco weed is the price paid for this efficiency. This habit becomes firmly fixed in these persons, and in my experience even after extensive surgery and hours of explanation, the patient will cooperate only to the extent that she will smoke with the lit end against the other side of the palate. Figure 1 shows the typical appearance of these tumors.

Statistically significant figures on the incidence of this problem in Panama have been impossible to obtain. Many of these patients never enter a hospital, and in the Interior of Panama the death certificates are often made out by the local officials without the benefit of professional medical assistance. Even the death certificates from Panama City are of little help since there is inadequate breakdown as to the specific area of origin when the cause of death is listed as cancer of the mouth.

Figures obtained from Panama City's large Santo Tomas Hospital are not truly indicative of the problem since many of these patients never go to the city, much less to the hospital. In addition, the practice of reverse smoking is not nearly as common in Panama City as in the Interior.

Nevertheless, the following figures were obtained. During the year 1954, 28,814 patients were admitted to Santo Tomas Hospital. Of these, 593 had cancer. Fifty-three, or 9 per cent

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 1. Typical appearance of an epidermoid carcinoma of the hard palate.

FIG. 2. Far advanced epidermoid carcinoma of the palate extending into the pharynx, mandible and invading cervical lymph nodes (4 to 5 cm.).

FIG. 3. Postoperative appearance. Patient died of a cerebrovascular accident four years later. Postmortem examination revealed no evidence of residual or recurrent cancer.

of the patients with cancer, had an oral cancer. Twenty-two, or over 40 per cent of the oral cancers, were primarily carcinomas of the palate.

Local pain is the most common symptom in these patients. A foul, nauseating discharge invariably followed when the mucosal surface was broken and infection by the intraoral organisms occurred. Cervical metastasis was present in the majority of patients, while metastasis below the clavicles was not noted. Death is almost invariably due to local causes such as hemorrhage, obstruction and secondary infection, complicated by inability to swallow properly, with development of inanition and pulmonary problems due to aspiration.

The method of therapy in Panama City has been and is radiation. Perusal of the records from the Radiological Institute of Panama and Santo Tomas Hospital reveals not a single "five-year cure." In addition, radiation did not give palliation and was frequently followed by osteomyelitis and slough of the bony portion of the palate.

Since 1954 surgical extirpation has been the method of choice for patients with these palatal cancers at Gorgas Hospital, Canal Zone. Although our small series is statistically insignificant, the results are encouraging.

The inflammatory component of these tumors can be misleading. Careful oral hygiene, irrigation and antibiotics for a period often markedly decreased the size of the tumor and should always be employed preoperatively.

Relief of pain and elimination of the discharge and bleeding from the tumor in cases in which resection was possible was uniformly obtained by surgical resection.

Surgical resection of these tumors is not difficult. Reflecting the cheek by cutting through the lower lip in the midline and extending the skin incision in a curving manner below the mandible and through the platysma ending at the mastoid process, and then freeing the mandibular attachments, gives excellent exposure. The diseased part is then on the surface. Control of the blood supply is no problem, and if the external carotid artery is ligated prior to the intraoral work, there is little blood loss while resecting the involved palate. Since no relaxation is necessary, anesthesia can be kept very light, and even the elderly tolerate the procedure well. Endotracheal anesthesia and tracheotomy at the conclusion of the resection should be routinely employed.

Since the cervical nodes are so frequently involved, neck dissection is also performed when the tumor is laterally placed or if cervical nodes are enlarged. Extirpation of the lymphatics *en bloc* with the other lateral neck contents from just beneath the platysma to the prevertebral fascia, from the clavicle upward, including a portion of the mandible and buccal mucosa when necessary to get around the tumor, is performed preserving only the carotid artery, sympathetic chain and vagus nerve. Ligation of the external carotid artery is performed to decrease the amount of intraoral bleeding at the time of surgery and decrease the chances of serious bleeding if the tumor re-

curs; however, it is omitted if a long mucosal pedicle flap from the buccal mucosa will be needed to cover the palatine defect, or if the lateral third of the tongue is to be used to fill in the palatine defect. The neck dissection, of course, precedes the intraoral work.

At times it is not feasible to perform the neck dissection *en bloc* with the palatal tumor. The specimens are then removed separately and radiation of the skip area is indicated.

Figure 2 shows an advanced lesion with additional involvement of the soft palate, lateral pharyngeal wall, angle of mandible and cervical metastasis measuring 4 cm. in diameter. The postoperative appearance is shown. (Fig. 3.) The patient died of a cerebrovascular accident four years after surgery. Postmortem examination revealed no evidence of recurrent or residual cancer. She received great palliation from the surgery and probably would have been a "five-year cure" if old age and the cerebrovascular accident had not intervened.

Although surgical excision of these tumors is relatively simple, reconstruction of the remaining defect can be a problem. Prostheses and obturators to plug the palatal defect are poorly tolerated by elderly patients and changing osseous contours due to atrophy add to the difficulty.

There is no one best way of closing the palatal defect. The surgeon must utilize the tissues that are available and improvise. The following methods have proved to be useful in reconstructing the defect:

Free skin graft: This can be employed successfully only if the mucosa on the nasal side of the palatine bone is intact.

Shifting the uninvolved palatine mucosa: Just as the mucosa can be shifted to cover a congenital defect of the cleft palate, so can the mucosa be shifted to cover the defect from resection.

Constructing a mucosal pedicle flap graft from the adjacent buccal mucosa: Considerable additional length can be obtained for this pedicle graft by fashioning it so that the free margin was the former lateral alveolar ridge mucosa. Such a broad based pedicle graft will reach past the midline since the cheek will naturally fall inward on the involved side after resection of the palate.

Construction of a mucosal pedicle graft from the posterior pharyngeal wall: This is especially useful for midline lesions and replacing the resected portions of the soft palate. When covering the nasal side of the palate, the pedicle graft is based superiorly. When covering the oral side, the base of the graft is placed inferiorly. This procedure has been used successfully for many years by surgeons operating on complicated cleft palates and has more recently been popularized by Conway [2].

Employing a denuded portion of the intact tongue: The tongue can be mobilized about a month later as a second stage procedure.

Employing the lateral third of the tongue with its intact blood supply as a permanent pedicle graft: This is an excellent procedure for large defects.

The functional results of these procedures are surprisingly good. When the tongue and lateral buccal mucosal grafts are used to reconstruct the palatine defect there is restriction of motion and difficulty with speech and mastication initially, but with the passage of time the patient and the tissues readjust to the new alignment very satisfactorily.

SUMMARY

1. An unusually high incidence of epidermoid carcinoma of the palate in Panama associated with reverse smoking (lit end within the mouth) is noted.

2. Radiation therapy of these lesions has produced no "five-year cures" and has not given palliation.

3. Preliminary results of the surgical management of these lesions are encouraging.

4. An outline of the surgical management is presented, the only difficult part being reconstruction of the palatine defect. This can be accomplished by the use of an obturator, free skin graft, shifting of the uninvolved palatine mucosa, using the intact tongue, or fashioning the lateral third of the tongue with its intact blood supply as a pedicle graft, and constructing mucosal pedicle grafts from the buccal mucosa and/or the mucosa of the posterior pharyngeal wall.

Acknowledgment: I wish to thank Dr. Ernesto Zubieta, Chief of the Radiological Institute, Dr. Julio C. Wong and Mrs. Palmira Sarasqueta, Records Librarian, for making it possible to review the records from the Radiological

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A Suggested Method for the Control of Staphylococcal Infections in a Large General Hospital

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TODAY almost every medical journal publishes some article referable to staphylococci in each issue. Most of these are quite specific in nature and deal with one particular aspect of the problem. Wound infections, a new antimicrobial agent, an epidemic of infections, or any one of the multitude of facets of this situation may be discussed in the articles.

The pharmaceutical companies have devoted a large measure of their antimicrobial investigative work to the staphylococcal field. Other allied firms have worked on the development of germicides for industrial and institutional use. Much attention has been given to cleaning blankets, filtering air, prophylactic antimicrobials, especially clothing treated with germicides, and many other aspects related to this field.

As staphylococcal infections emerged as a serious problem throughout the country in the past few years, The New York Hospital–Cornell Medical Center was faced with the question of how to cope with this situation. The correct method of handling it is still unknown, but by trial and error a program has been designed which seems to be beneficial for the patient, the personnel, and the institution as a whole. Perhaps the single most helpful result of this program has been that the various factors, such as carrier state, blankets, germicides, etc.), have been put into a more reasonable perspective. Since the physicians and hospital administrators are deluged with all sorts of representations to rid the hospital of the staphylococcus, it is believed that an outline of the program now in use at The New York Hospital–Cornell Medical Center would be of some value, particularly in regard to weighing the importance of the many factors involved.

THE PROBLEM

There is no need to dwell on this at length, for all concerned know it only too well. Essentially, the problem falls into three categories: (1) an increased virulence and/or resistance of certain strains of pathogenic staphylococci (the 80–81 strain), (2) the decreased host resistance (many more extensive procedures are now used in patients who are older, or more debilitated), (3) the ubiquity of the staphylococcus. Thus hospitals are dealing with drug-resistant organisms that can and do survive for long periods. These organisms are passed around from personnel to patients, and they also remain in various reservoirs throughout the institution. These reservoirs are blankets, mattresses, curtains, dust, clothing, masks, and many others.

Some institutions have been harder hit than others. This is almost certainly not because one hospital was more cautious than another, for all of the medical profession was lulled into laxity in the early antimicrobial era, but rather because when the early epidemics started in various sites others took warning and apparently tightened their security measures in time.

Another factor of importance is the physical layout of a hospital. The number of visiting physicians and the amount of their participation in hospital activity is also significant. The control of the latter group, for example, may be extremely difficult. The situation at The New York Hospital–Cornell Medical Center during the past twelve years has remained relatively constant. In the early portion of this period,

and probably for at least the first half, this unchanged condition was probably fortuitous. For example, the wound infection rates in the Department of Surgery over this period of time have been low as reported by Dineen and Pearce [1]. The wound infection rate has remained constant during this entire period, and up to the present, at about one per cent for all cases. About half of these wound infections are staphylococcal and the other half are caused by enteric organisms. There have been one or two years when the number of staphylococcal infections rose much higher than in other years. There is no clear-cut explanation for this. However, for the past three years the rate has remained constant. There has been no true epidemic of staphylococcal infections in the hospital as a whole. In the Department of Pediatrics there have been several problems in the newborn nurseries, and these have required very close attention and supervision. These will be made the subject of a separate report by Eichenwald [2]. Over the past two and a half to three years the hospital has been invaded by the epidemic strains of staphylococci, particularly those of the phage-type 80–81. This invasion occurred by way of the pediatric nurseries and has gradually appeared throughout the remainder of the hospital. Statistically, this strain has not caused an increased number of adult infections, but rather has replaced the previous untypeable staphylococcus which is resistant to penicillin as the so-called "hospital strain." Thus the twenty-five or so staphylococcal infections expected to occur in wounds on the surgical pavilions each year are now caused almost exclusively by the 80–81 strain. Therefore, it is safe to say that the Medical Center is completely saturated with this strain of staphylococcus, and it is believed that an epidemic has not occurred only because of the program used in control of staphylococcal infections in this hospital. This program depends to a great degree on the cooperation of nonprofessional as well as professional personnel, and is practiced carefully every day by all concerned.

THE PROGRAM

Control of infections, particularly staphylococcal infections, requires the alert attention of all hospital personnel. To coordinate the efforts of all concerned the Medical Board has established a Staphylococcal Committee [3] which includes representatives from all clinical departments and from the hospital administration. A subcommittee of the Staphylococcal Committee functions as a maintenance and cleaning committee. This subcommittee meets regularly each month with the head of the Building Service Department and with the Director of the Hospital, the President of the Medical Board, and the Director of Nurses. It is our belief that the presence and interest exhibited by the Director of the Hospital and the President of the Medical Board are of extreme importance in lending weight to decisions of this Committee and also makes personnel, all the way down the line, realize that great significance is placed on cleaning and maintenance of the hospital.

The control program itself can be divided into six parts as follows:

Detection. Detection of staphylococcal infections is a function of the professional staff. It is necessary that all physicians and nurses be made aware that a staphylococcal problem does exist throughout the country and specifically in each individual hospital and that staphylococcal infections must be looked for and treated. Consequently, it is important that every staphylococcal infection be detected. To a large extent this will fall into the hands of the nurses because very often a staphylococcal infection may develop after the patient has been in the hospital for several days. If this lesion is not in an area that the physician would usually examine in his follow-up rounds, it may go unnoticed. For example, if a patient has an appendectomy and subsequently develops a boil on his back it may only be the nurse or nurse's aide who is caring for the patient who will be aware of it. Consequently these people should also be instructed as to the necessity of looking for such lesions.

Reporting. After a lesion has been detected, obviously it must not only be cared for appropriately, but in order that this information may be of some value epidemiologically, all suspected lesions must be cultured and reported. The culturing technics of the specimens obtained from such lesions can vary with the preference of each individual bacteriologic laboratory. However, the method used at The New York Hospital–Cornell Medical Center is to culture all lesions for diagnostic purposes in the routine manner aerobically and anaerobically. Any lesions which are cultured exclusively to determine whether or not they are staphylococcal in nature are plated on a

Gram-negative inhibitory medium, such as Stone's medium. Following this primary isolation the staphylococci are tested for susceptibility to drugs and then phage-typed if they are coagulase positive.

Coordination. In one central location within this center all the reports are tabulated as to their location, phage-type, and antimicrobial pattern. It is possible, as this information comes into the central clearing office, to determine whether or not one area is suddenly becoming flooded with positive cultures. This information reveals any area where a localized epidemic may be occurring and helps in actually locating the specific source. It is particularly helpful with hospital personnel. Although they are treated in the Personnel Health Service, hospital personnel are reported and their lesions tabulated from their place of duty.

Clinical Treatment. Information from the staphylococcal laboratory and from the main laboratories is returned as quickly as possible to the floor where the patient is located and the appropriate treatment is given on that floor. It is not within the scope of this report to discuss the various methods of treatment. Basically, the principle employed for localized staphylococcal infections in this center is to institute adequate drainage without the use of antimicrobial agents. For systemic infections one or more appropriate antimicrobial agents are used in high dosage levels as indicated. The details of management in this center have been outlined by Rogers [4].

Isolation. There has been a great deal of controversy throughout the country as to the importance and degree of isolation. Also, it is extremely difficult in some areas to institute appropriate isolation. Consequently, there is difficulty in determining what can best be done with the available physical layout in any one hospital. Ideally, all cases of staphylococcal infections would be isolated. However, this is certainly not practical in most institutions. The next step, if this were not practical, would be to isolate all patients with the epidemic strain, or 80–81 strain. At the present time an attempt is being made in this Medical Center to use this type of isolation; namely, all patients with epidemic staphylococcal infections are isolated. This does not necessarily mean that each patient is put into a single room because in many areas this is not feasible. When this cannot be done steps are taken to keep the infection as well localized as possible. This is done by having the lesion covered with an occlusive dressing or having the patient wear a mask if one is dealing with a respiratory type of infection. All personnel visiting or dealing with this patient wear masks. If they have intimate contact, they also wear gowns and gloves. Immediately following contact the personnel wash their hands thoroughly with a germicide solution. Utensils such as plates, cups and silverware are scraped and soaked in a germicide solution before washing. Wash sterilizers are not fully in service in all diet kitchens.

Prevention. Prevention is considered to be the most important phase. After consideration of the data available from this Medical Center and from all similar hospitals and medical centers it is believed that there are three areas which constitute possible sources of infection to patients and personnel. These are (1) an open infected case, (2) a carrier, and (3) the hospital reservoir. Therefore, attacks to prevent the spread of the staphylococcus should be directed at these three previously mentioned areas. The infected patient is readily noted by all and is considered by every one to be a source of contamination to others. Infection is handled by treatment and by isolation.

The carrier state is not well documented as a source of contamination but certainly there is ample evidence that the carrier can cause contamination in certain critical areas, particularly in the newborn nurseries and in the operating rooms. Eichenwald [5] has shown conclusively that nursing mothers who are carriers will infect their infants. The carrier is commonly detected in one of two ways. (1) The carrier has had a lesion of some sort and has been seen and followed up in the Personnel Health Service. When the lesion disappears, routine follow-up nose and throat cultures reveal that this person continues to carry the pathogenic strain of staphylococcus in the nasopharynx. (2) Some carriers have never developed any overt lesions as far as our records indicate. This, actually, is relatively rare. Nevertheless, it is the practice of the Pediatric Department because of this to routinely culture the nasopharynx and oropharynx of all personnel working in the nurseries. A similar culturing routine is in practice in the operating room areas. When a carrier is detected in the operating rooms and in the nurseries, he or she is taken off duty and kept off duty and out of patient contact until such time as the cultures are negative. In the past few months we have

allowed personnel with positive nose or throat cultures to return to duty in patient contact in noncritical areas, that is, in areas other than the operating rooms, the delivery floor, the nurseries and all of pediatrics. Originally, all personnel with positive cultures were kept off duty and away from patient contact. There has been no increase in the rate or degree of infection since this new program has been in effect. We have concluded, therefore, that carriers can safely work in noncritical areas.

Another important factor in the prevention of the spread of resistant staphylococci is the restriction of the use of the antimicrobial drugs. This subject has been well covered in many other articles and will not be dwelled upon here [6].

The third danger area for possible contamination of patients is the so-called "hospital reservoir." This is a vast unknown area which is probably a source of many clinical infections and establishment of many carrier states. The reservoir includes blankets, beds, curtains around the bed area, floors, walls, bedside tables, stretchers, mattresses, garbage pails, dressing containers, and many other such areas [7,8,9]. It is important to cut down on the number of staphylococci in these areas for it is known that the staphylococcus can live in such locations for many months and be a source of real danger. Therefore, the following steps have been recommended:

1. A regular systematic cleaning of all areas should be done. *Mechanical removal of dirt is most important.* Such procedures as damp mopping, scrubbing, and other physical steps which remove gross dirt are mandatory.

2. Regular inspection is made by a team composed of members of the housekeeping department and clinical staff. This checks on the degree of cleanliness at fixed intervals and ascertains that a satisfactory level is maintained. It is particularly important to inspect the operating rooms, the delivery rooms, nurseries, and laundering facilities.

If these two steps are utilized adequately, the reservoir should be reduced with removal of mechanical dirt and this is probably the single most important step. In an effort to maintain this cleanliness and to establish a surface that will be antagonistic to bacteria many different substances have been used that have varying degrees of germicidal activity and long-term activity. There are so many of these materials and agents now available that it is almost impossible to list even a small representative number. However, there are certain criteria which have been established for a good hospital germicide. Ideally, a substance should be nonirritating and non-toxic in the amount used. It should have a long period of action extending into weeks. It should be readily applicable to hard surfaces, to cloth, and also to laundering rinse waters. Its purpose is to kill bacteria on contact and leave a residual activity which would prevent the development of a reservoir wherever this material is located. We have had experience with various germicides including heavy metals, phenols, chlorine, iodines, quaternary ammonium compounds, organotin compounds, alcohols, and formaldehydes. After a careful evaluation of these various substances we have ruled out the materials using heavy metals because these are inactivated by organic compounds to a large extent. They are also quite toxic and even in low concentration may sensitize individuals. The phenol compounds have been useful in a certain situation, particularly for cleaning floors, walls and hard surfaces. We have used a phenolic compound for three years for general hard surface cleaning. They are not suitable for inclusion in laundering processes in high enough concentrations to be effective. Their germicidal activity, however, is good. The compounds of the chlorine type are effective germicides and are useful for direct application to the patient but are not as suitable for additives to cleaning solutions as they do not have a long-term activity and they are not useful in contact with metal objects. The iodine compounds are effective germicides, and the iodophor compounds, which are used for preparation of the skin and for other direct use on the patient, are particularly useful. They, of course, are not useful for cleaning the walls or floors or for laundering. The so-called cationic detergents or "quats" are not good germicides as has been demonstrated many times [10]. They do not have a prolonged action. Formaldehydes are also good germicides but the smell, of course, precludes their use in many areas and they are not useful in the laundry. After testing many of these compounds we have selected for use at the present time dibromosalicylbromanilide.* This material has several of the advantages outlined for an ideal germicide for general hospital use. (1) It can be used in low concentrations, usually less than one per cent,

* Manufactured and supplied as SBT-12 by Lever Brothers, New York, New York.

while maintaining effective action without the emergence of resistance by staphylococci. (2) It can be used in the laundry. (3) It can be used for application to the walls and floors when cleaning. (4) It can be used as a direct antiseptic spray for decontaminating mattresses, beds, bedside tables, and other physical equipment. It is presently being used at The New York Hospital–Cornell Medical Center in two ways. It is added to the rinse water of the laundry wash cycle. The dibromosalicylbromanilide is exhausted from the rinse water to the fabric and imparts antibacterial activity during use. Treatment of laundry with this germicide at The New York Hospital–Cornell Medical Center has been in effect for over one year. There have been no reported instances of primary irritation or sensitization by any person. The material is not inactivated by autoclaving. The second use of this material has been for the direct spraying of contaminated areas. This material can be used as an aerosol spray and the housekeeping department uses it for spraying of beds, mattresses, curtains and other fixtures which cannot be easily or readily removed from the room after the discharge of one patient and before another patient uses the bed. This takes only a matter of minutes and an effective antistaphylococcal agent is applied. Another use of this spray is for spraying of surgeons' shoes before entering the operating rooms. Despite all efforts and despite constant supervision it is always difficult to prevent people with contaminated shoes from entering the operating rooms. Therefore, after the study of reports submitted on the bacteriologic activity of dibromosalicylbromanilide on the soles of shoes, it has become a regulation of the Operating Room Committee to require every person on entering the operating room to spray the soles of his shoes with an aerosol spray of SBT-12 which deposits a protective film of dibromosalicylbromanilide on the surface after evaporation of the solvent (which requires about 10 to 15 seconds).

At the present time blankets are washed in the hospital and impregnated with this material. This germicide is also used in certain areas for direct cleaning of the walls and floors. It is found that the antibacterial activity is retained between applications. Materials treated with dibromosalicylbromanilide are still active for periods as long as one year as demostranted by tests performed employing official bacteriologic procedure for textiles [*11*]. Specific details of the antibacterial activity of dibromosalicylbromanilide and methods of evaluating it as a hospital germicide will be the subject of a report to be published shortly.

SUMMARY

The problem of staphylococcal infections in this country and in The New York Hospital–Cornell Medical Center is a serious one. Infections have been kept at a low level here by constant vigilance maintained by a Joint Administrative and Clinical Committee. The control program consists of (1) detection of staphylococcal infections, (2) reporting them, (3) coordination of reports, (4) clinical treatment, (5) isolation, and (6) prevention.

In the latter category the mechanical removal of dirt is believed to be the most important. A new germicide, dibromosalicylbromanilide, has been tried for over one year as an additive to the laundry rinse water, as a spray for operating room shoes, beds, mattresses, curtains, etc. It is non-toxic and effective.

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Treatment of Squamous Cell Carcinoma of the Buccal Mucosa

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CONSIDERABLE diversity of opinion prevails regarding the most effective method of treating squamous cell carcinoma of the buccal mucosa. Even though the histologic grade of these lesions is frequently low (grade 1 or 2, using Broders' method), only a fair rate of survival of patients with these cancers is reported in the literature.

Squamous cell carcinomas of the buccal mucosa usually originate oposite the line of articulation of the upper and lower teeth, or in the retromolar commissure. As a rule, they present as an ulcerated surface with distinct borders; however, other lesions of low histologic grade may develop in regions of thickened leukoplakia and may possess a rough papillary surface.

Even though the tumors are of low average histologic grade, they exhibit unusual tendencies toward local recurrence. Tumors that arise in or extend to the retromolar commissure are particularly likely to recur locally. In general, squamous cell carcinomas of the buccal mucosa metastasize later and less frequently than squamous cell carcinomas of the tongue. However, cervical metastasis occurs sufficiently frequently that it compounds the difficulty of treatment of these lesions.

At the Mayo Clinic most of these tumors have been excised when they were small and well localized. If they were large, the raw buccal surface was lined with a split-skin graft. Large lesions with ill-defined limits or those that extended to the retromolar commissure and tumors that extended to the mucosa of the lower jaw usually were removed by thorough electrocoagulation. Patients with lesions that penetrated or nearly penetrated the full thickness of the cheek customarily were treated with electrocoagulation, or the patient was referred for radiation therapy. Penetrating tumors of the cheek treated by electrocoagulation resulted in large through-and-through defects of the cheek which were secondarily closed by plastic surgery. In recent years, the utilization of a composite resection of the cheek, jaw and cervical node has been advocated for extensive buccal cancers, especially those that extend to the lower jaw. A few of these procedures were performed during the later years of the study. In some cases, supplementary treatment with radium or roentgen rays was employed after removal by electrocoagulation. Patients with huge inoperable tumors were given palliative radiation therapy.

In general, prophylactic dissection of cervical lymph nodes has been a part of the treatment for squamous cell carcinoma of the buccal mucosa less frequently than it has been for cancer of the tongue. As a rule, clinically involved cervical lymph nodes were removed by block dissection of the neck.

In contrast to this approach, most authors favor treatment of the primary lesion by radiation, with the local use of radium, teleradium, or external x-ray therapy. Patients with involved cervical lymph nodes usually are treated by block dissection or radiation.

It is the purpose of the present study to determine the results of treatment of all patients with squamous cell carcinoma of the buccal mucosa treated at the Mayo Clinic from 1945 to 1954 inclusive, and, if possible, to ascertain the best method of treatment of these lesions.

FACTORS OF SELECTION

During the period 1945 through 1954, seventy-seven patients with pathologically verified invasive squamous cell carcinoma of

the buccal mucosa were treated at the Mayo Clinic.* This included all patients who received any form of treatment whatsoever in whom tissue was available for pathologic verification. All microscopic sections were reviewed by one of us (E. G. H.) and the diagnosis of squamous cell carcinoma was verified. Patients who had primary malignant tumors of the cheeks other than squamous cell carcinoma were excluded. Eighteen patients were excluded who did not receive treatment at the clinic. These patients either came for consultation only, refused treatment, sought treatment elsewhere, or were hopelessly incurable and returned home for palliative treatment. One patient who was treated without biopsy was excluded. In two patients, the only pathologically positive tissue had been removed elsewhere and was unavailable for study; these two patients, therefore, were excluded. In five cases the carcinomas were thought to be totally *in situ*. It is possible that if the whole tumors had been available for study and multiple sections had been taken through them, areas of invasion might have been found. In any event, to limit the study to proved invasive squamous cell carcinoma, these five cases were excluded. Patients having carcinoma *in situ* form a desirable group for treatment in that treatment is usually highly successful.

DATA IN PRESENT STUDY

Age and Sex Distribution. The mean age of the seventy-seven treated patients was 64.1 years, with the range from thirty-seven to seventy-nine years. Sixty-seven patients were men and ten were women.

Location and Extension of Lesions. A total of thirty-six tumors developed on the right side of the mouth, and forty-one on the left side. As was stated previously, lesions that appeared to develop in the region of the retromolar commissure were included in a previous study [4]. However, twelve patients had tumors that appeared to develop on the main part of the cheek and extended to the retromolar commissure. Extension to the lower gingiva was present at the time of admission in thirty-one patients, and further extension into the mandible was present in fifteen of these. Extension to the upper gingiva was present in fourteen patients. In three patients the tumors extended through the full thickness of the cheek. Involvement of cervical nodes on admission was pathologically proved in twenty-three patients (29.9 per cent).

Previous Treatment. Of the seventy-seven patients, eighteen had received some treatment in an attempt to control the tumor prior to admission to the clinic (excluding biopsy).

Histologic Grade of Lesions. The degree of malignancy of these tumors (by Broders' method) was as follows: seventeen tumors were grade 1; forty-five, grade 2; fourteen, grade 3; and one was grade 4.

Multiple Cancers. Additional malignant tumors had been present or developed later in twenty-one of the seventy-seven patients. In nineteen patients these additional cancers were in the oral cavity.

Treatment of the Primary Lesion. Table 1 indicates the treatment instituted at the clinic for control of the primary lesion of the cheek. To avoid confusion, only the first attempt at control of the primary lesion at the clinic is listed. Obviously, the first therapeutic attempt is the most important in the ultimate control of the tumor. In those patients in whom the primary tumor was not controlled by the initial treatment, further measures were employed.

Forty-six patients with primary buccal

TABLE 1

SQUAMOUS CELL CARCINOMA OF THE BUCCAL MUCOSA (CHEEK): INITIAL TREATMENT OF THE PRIMARY LESION AT MAYO CLINIC

Treatment	No. of Patients
Electrocoagulation	46
Excision or excision and skin graft	11
Electrocoagulation with or without radium or x-ray therapy	13
Combined operation (cheek, jaw, neck)	4
No treatment (primary lesion controlled elsewhere)	3
Total	77

* For purposes of this study, the cheek (buccal mucosa) is defined as that portion of the oral mucosa lying between the upper and the lower alveolus. Carcinomas that appeared to develop in the retromolar commissure were not included in this study, since they have been included in a previous study from the clinic on squamous cell carcinoma arising in the mandibular gingiva [4]. During this same ten-year period, 118 patients with squamous cell carcinoma of the mandibular gingiva were treated at the Mayo Clinic [4], as were also 269 patients with squamous cell carcinoma of the anterior portion of the tongue, 102 patients with squamous cell carcinoma of the floor of the mouth, and 174 patients with squamous cell carcinoma of the upper jaw and antrum [5–7].

carcinoma were treated initially with thorough electrocoagulation. (Table I.) In eleven patients, the primary lesion was surgically excised. If the lesions were large, intraoral skin grafts were applied to the created raw oral surface. Thirteen patients with primary lesions were treated with external radiation or local use of radium. In some cases, this treatment followed electrocoagulation of the primary tumor. In four cases, a combined resection of the cheek, jaw and cervical lymph nodes was performed. In three cases, the primary oral lesion had been controlled by treatment elsewhere, but the patients came to the clinic for treatment of metastatic lesions of the cervical lymph nodes.

Treatment of Cervical Lymph Nodes. In twenty-three patients, metastatically involved cervical lymph nodes were present on admission to the clinic. Two patients with cervical metastatic lesions were treated by radiation, and one patient refused treatment. In the remaining twenty patients, the cervical metastatic lesions were removed by block dissection of the neck (including block dissection performed as part of a composite operation). In some instances, dissection of the neck was performed in the absence of clinical evidence of metastatic involvement. If the metastatic tumors were not controlled by the initial measures, further therapy was employed in an attempt to eradicate them.

Incidence of Cervical Metastasis. Twenty-three patients had metastatically involved cervical lymph nodes on admission to the clinic, and in eleven additional patients, cervical metastasis was known to have developed subsequent to initial examination. Thus, cervical metastasis occurred at some time during the course of the disease in at least 44 per cent of the patients. This figure probably would be higher if complete information regarding cause of death were available for all patients. In four patients, metastasis occurred to the side of the neck opposite the primary lesion (crossed metastasis).

Some form of block dissection of the neck was performed nineteen times when clinical evidence of involvement of the lymph nodes was absent. This number includes bilateral block dissection which was counted as two procedures. Histologically, lymph nodes were found to be involved by carcinoma in three of the nineteen dissections (15.8 per cent). Likewise, a total of thirty-three block dissections were performed in patients in whom the lymph nodes appeared to be clinically involved. Histologically, lymph nodes were found to be involved in twenty-eight patients and to be uninvolved in five, which gave a rate of "error" of 15.2 per cent.

SURVIVAL OF PATIENTS

Survival data showed that seventy-one of the seventy-seven patients were eligible for follow-up study, that is, they were treated five or more years prior to the date of inquiry, January 1, 1959. Thus, all patients treated before January 1, 1954, were included. Hospital deaths are excluded in the calculation of survival rates. Of the seventy-one eligible patients, sixty-eight were followed up; thirty-four of these survived five years or more after operation. The five-year survival rate of eligible patients who were followed up is 50 per cent.

There were twenty-two eligible patients with nodal involvement on admission; two were not followed up, and four survived five years or more, giving a five-year survival rate of 20 per cent. Among the forty-nine eligible patients without nodal involvement, one was not followed up; thirty survived five years or more, giving a five-year survival rate of 62.5 per cent.

The five-year survival rates by grade of malignancy (by Broders' method) are as follows: grade 1, 62.5 per cent ($^{10}/_{16}$, one untraced); grade 2, 54.1 per cent ($^{20}/_{37}$, one untraced); grade 3, 28.6 per cent ($^{4}/_{14}$); grade 4, only one patient who died before the end of five years.

Because each category of therapeutic method included only a relatively small number of patients, and because of the many variables encountered in the study, exact conclusions could not be reached regarding the most efficacious method of treatment of these tumors, Of most significance is the five-year survival rate of 50 per cent of the patients who were followed up. The great majority of these patients had their tumors removed surgically, either by thorough electrocoagulation or by excision. Radiation was used as a primary therapeutic modality in relatively few patients. The survival rates in other reported series of carcinoma of the cheek are listed in Table II.

COMMENTS

The majority of authors favor treatment of primary cancer of the buccal mucosa by ex-

TABLE II

CARCINOMA OF THE BUCCAL MUCOSA: REPORTED SERIES

Authors	Years of Treatment	No. of Patients	Factors of Selection	Predominant Treatment		Survival Rate (%)	
				Primary Lesion	Neck	5-yr. Absolute	5-yr. Determinate
Breed [1]	1930–49	51 treated; 42 eligible	Presumably unselected	Radium	Radium	15/42 = 35.7	
Modlin and Johnson [12]	1940–50	Total 125; 63 treated; 42 traced	Surgical cases; cheek and lower gingiva	Surgical, including combined operations	Operation		22/42 = 52.4
Lampe [10]	1950–51	Total 39; eligible 27	Cheek and lower gingiva; untreated patients	Radiation	Radiation	29.6	
Clifton and Hardin [3]	1932–55	Total 75; eligible 59	Presumably unselected	Radiation	Radiation	9/59 = 15.3	
Paterson [14]	1932–35	Treated 83	Presumably unselected	Radiation	Operation	33	
Jackson and New [9]	1932–41	Treated 107; traced 93	Surgical cases	Electrocoagulation or operation	Dissection of neck		48/93 = 51.6
Cade [2]	1925–37	Treated 34; eligible 18	Unselected	Radiation	Radiation	11/18 = 61	
Martin and Pflueger [11]	1925–29	Traced 99	Traced patients, otherwise unselected	Radiation	Dissection of neck or radiation		28/91 = 30
Our series	1945–54	Eligible 71; traced 68	Squamous cell carcinoma, all treated patients	Electrocoagulation or operation	Dissection of neck		34/68 = 50

ternal x-ray therapy or by radium. Small lesions usually can be removed adequately surgically, especially if near the angle of the mouth. Equally good removal of a lesion located in the anterior part of the cheek can be accomplished by thorough electrocoagulation [8]. Carcinomas that extend deeply into the substance of the cheek, or through the cheek, are exceedingly difficult to eradicate. Wide removal of these lesions by electrocoagulation or excision, although it leaves a large through-and-through defect of the cheek, may result in successful eradication of the tumor. If removal of a large deeply infiltrating lesion of the cheek leaves a big perforation, the defect should be left open; later it can be closed secondarily by plastic surgery. Attempts at primary closure of the defect may tempt the surgeon to compromise on the adequacy of removal of the lesion. Furthermore, the probability of recurrence of such an extensive growth would be high, and if it recurred, primary plastic reconstruction would be of little avail.

Tumors that extend into the retromolar commissure and pterygoid region are especially difficult to eradicate. Lesions in this location, as well as those extending into the retromaxillary fossa and to the upper gingiva, do not lend themselves well to any radical surgical treatment or composite operation. Patients with these lesions, as well as those in the retromolar commissure and pterygoid region, are best treated by thorough electrocoagulation or radiation, or a combination of the two methods. Severe trismus and fibrous ankylosis will likely result, but the jaws can usually be kept mobile by use of a mouth stretcher. Severe ankylosis not responding to these conservative means may require section of the mandible with creation of a false joint. Composite operations serve a useful purpose in this disease if large lesions of the lower buccogingival sulcus have extended on or into the mandible. Because of the sparsity of reports of the effectiveness of this operation on oral cancer, it is difficult to assess its true value. Five of the fifty-eight combined

resections of the neck and jaw reported by Morfit [13] were performed for lesions that arose on the buccal mucosa.

As will be noted in Table II, the survival rate in this unselected group of patients with carcinoma of the buccal mucosa is commendable. From the data presented, it appears that treatment of these patients by the methods previously described is equally as good as treatment by radiation. During this period, the majority of these tumors were removed surgically by thorough electrocoagulation or excision. If metastatic nodes were not present on the patient's admission, a five-year survival rate of 62.5 per cent was obtained. However, if metastically involved nodes were present on admission, the ultimate outcome was much poorer. Thus, it appears that although the primary lesion may be persistent and difficult to control, cervical metastatic involvement is an important factor in the eventual cure of the patient.

Should more radical dissection of the cervical lymph nodes be carried out? Should more dissections of cervical glands be performed in the absence of clinical evidence of metastasis (prophylactic dissection of nodes)? The total incidence of cervical metastasis of at least 44 per cent suggests that prophylactic dissection of nodes may be of value. However, in the present study, in only three of the nineteen nodal dissections performed in the absence of clinical evidence of metastasis, were metastatically involved nodes found (15.8 per cent). What could have been accomplished by more frequent use of prophylactic dissection of nodes, composite operations, supplementary radiation, or a program of combined surgical treatment and radiation, cannot be answered with this study.

SUMMARY

A study was made of seventy-seven patients with squamous cell carcinoma of the buccal mucosa (cheek) treated at the Mayo Clinic from 1945 through 1954. All patients who received any form of treatment were included.

A five-year survival rate of 50 per cent of the patients who were followed up was obtained.

An attempt was made to determine the most effective method of treatment of these lesions. Because of the difficulty in estimating the extent of the disease from the records, and because of the small number of patients in each category of treatment, no exacting conclusions could be drawn regarding the most effective method of treatment.

In contrast to the many reported series in which radiation was the mainstay of treatment, most tumors in this series were removed by thorough electrocoagulation or excision, and cervical metastatic lesions were removed by block dissection of the neck. In this unselected series, a survival rate was obtained which was equally as good as has been obtained with other methods.

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Cholecystostomy in the Aged

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BILIARY tract disease is now the most common reason for abdominal operation among elderly patients. Since it is for patients considered such poor surgical risks that cholecystostomy is generally reserved today, we thought that a review of our recent experience with this operation would be of interest. The management of aged patients following cholecystostomy is often a difficult problem, and we hope that the conclusions we have reached will be of value to other surgeons.

HISTORICAL BACKGROUND

Cholecystostomy may have been performed as early as 1743 by Petit in Paris. However, his patient did not survive [1]. In the course of exploring the abdomen of a woman with a presumed ovarian cyst, Bobbs, an American, encountered in 1867 a distended gallbladder containing stones and drained it. His patient made an uneventful recovery and this is the first recorded case of cholecystostomy with survival [2]. The first deliberately planned cholecystostomy was performed by Sims [12] in 1878, and, further, a successful procedure was performed later that same year by Kocher [1]. During the ensuing half-century, cholecystostomy became a widely used procedure in the surgical treatment of both acute and chronic cholecystitis.

Cholecystectomy, first performed by Langenbuch [11] in 1882, gradually became the operation of choice in the management of chronic cholecystitis as surgical technic improved. The employment of cholecystectomy in the treatment of acute cholecystitis has been adopted more recently. Clinical and statistical studies of Heuer [9] and many others have shown that cholecystectomy has many advantages over cholecystostomy in terms of over-all morbidity from cholecystitis. During the past two decades cholecystectomy has become recognized as the ideal procedure in the surgical management of cholecystitis.

Cholecystostomy, in this same period, has come to be reserved for those patients considered extremely poor surgical risks whom it is believed could not possibly survive the definitive operation of cholecystectomy. Many surgeons view cholecystostomy as a poor operation in which the diseased gallbladder is not removed, following which symptoms recur in a very high percentage of patients. Cholecystostomy has acquired the character of a desperation measure, an occasionally necessary expedient to be endured until cholecystectomy can be performed. It is unfortunate that cholecystostomy should have gained this reputation. It is encouraging that recently there is increasing evidence of a change in our attitude, for when indicated, it can be a lifesaving maneuver in the management of severe acute cholecystitis, particularly in the aged.

INDICATIONS FOR CHOLECYSTOSTOMY

Indications for cholecystostomy in acute cholecystitis are never absolute, but relative to many factors, which may be considered in the following three groups.

First, a planned cholecystostomy, generally with the patient under local anesthesia, is indicated in those patients whose age, debility and severity of a coexisting degenerative disease, or particularly severe acute disease, increase their risk so as to preclude cholecystectomy.

Second, cholecystostomy should be selected during operation when in the surgeon's judgment inflammatory reaction and edema so obscure the structures in the portal triad that cholecystectomy becomes technically too diffi-

TABLE I
AGE OF PATIENTS AT TIME OF CHOLECYSTOSTOMY

Age Group	No. of Patients
40–49	2
50–59	3
60–69	5
70–79	13
80–89	13
90–99	2

cult without significant risk of injury to adjacent structures.

Third, cholecystostomy should also be selected when the patient's condition deteriorates rapidly during an elective cholecystectomy.

There is little or no indication for the performance of cholecystostomy in the treatment of chronic cholecystitis.

MATERIAL

During the decade 1949 to 1958, inclusive, forty-five patients underwent cholecystostomy at the King County Hospital. The diagnosis was acute cholecystitis in thirty-eight of these patients, and it is this group which will be considered in detail in the present report.

Six cholecystostomies were performed as palliative therapy in the course of carcinoma involving the structures of the porta hepatis, and one operation was performed for biliary decompression during the management of severe pancreatitis with formation of pseudocysts. These cases will not be considered further. No cholecystostomies have been performed for chronic cholecystitis.

All patients in the group under review have been followed up to the present writing, or until death from causes unrelated to gallbladder disease, by examination in the hospital outpatient clinics or, when this was not possible, by correspondence (thirteen patients).

Age, Sex and Race. The youngest patient was forty years of age; the oldest ninety-eight years of age at the time of operation. The average age of the patients was seventy-four years. Eighty-seven per cent were over sixty years of age and three-fourths were seventy years of age or older. (Table I.) There were twenty-two male and sixteen female patients. All patients were white, with two exceptions: one patient was Negro and one Oriental.

TABLE II
DURATION OF PRESENTING ILLINESS

Time from Onset to Admission (hr.)	No. of Patients	Male Patients	Female Patients
In hospital at onset	4	3	1
0–24	13	6	7
25–48	5	2	3
49–72	4	3	1
73–96	4	3	1
More than 96	6	4	2
Not specified	2	1	1
Average delay (hr.)	70	82	56

The preponderance of male patients in this group has also been noted by others [7,10]. While difficult to explain with precision, it is our opinion that two factors probably account for this preponderance: first, acute cholecystitis in elderly persons tends to affect the sexes more equally in distinction to the predilection for females seen in younger patients; and, second, as a group, the male patients in this series tended to delay longer following onset of their acute symptoms before they presented for treatment. As a result, the male patients were more often seriously ill and a drainage procedure may therefore have been selected more often. (Table II.)

Presence of Associated Disease. As might be expected in any group of elderly patients, chronic degenerative diseases were present to some degree in all but two patients in this series. Serious organic heart disease, manifested by an abnormal cardiac rhythm or a history of previous heart failure, or myocardial infarction was present in 67 per cent. Manifest congestive heart failure was present in 24 per cent on admission to the hospital. Significant pulmonary fibrosis or emphysema was present in 26 per cent; one patient had acute pneumonia on admission. There were three patients with diabetes in this group, and two of these were in severe diabetic acidosis on admission. (Table III.)

History of Gallbladder Disease. Previous gastrointestinal symptoms were denied or no history of gallbladder disease could be obtained from nearly half of our patients; however, 53 per cent gave a definite antecedent history of symptoms consistent with chronic gallbladder disease. Pain was the commonest

TABLE III
ASSOCIATED DISEASE STATES

Disease	No. of Patients	Per cent of Series
Organic heart disease	25	67
Hypertension	5	13
Congestive heart failure	9	24
Pulmonary fibrosis	10	26
Vascular lesions of the central nervous system	10	26
Chronic pyelonephritis	4	10
Diabetes mellitus	3	8
Obesity (pronounced)	12	32
Chronic alcoholism	3	8

chronic symptom, being present to some degree in three-fourths of those patients who were symptomatic. Smaller numbers of patients had experienced postcibal fullness and eructation, or intolerance to specific fatty foods. Three patients had undergone previous cholecystostomy during an acute attack of cholecystitis.

Symptoms. Pain, related to the acute attack of cholecystitis, was the predominant symptom; pain was felt in some part of the abdomen by every patient. As might be expected, the right upper abdominal quadrant was the commonest location, pain being noted in this region exclusively in 60 per cent. Some upper abdominal localization of pain was present in 87 per cent. Five patients presented atypical patterns of pain which are of interest. Two patients had initial mild periumbilical and epigastric pain which later shifted to the right lower quadrant; two others had pain well localized to the right lower quadrant from onset. The fifth patient had diffuse bilateral lower abdominal pain. The abdominal localization of pain as perceived by the patient usually, but not always, correlated with the localization of objective findings on physical examination.

Anorexia occurred in 82 per cent of patients, nausea without vomiting in 74 per cent and vomiting in 53 per cent. A history of shaking chills, usually associated with subjective feelings of fever, was elicited from only five patients.

Vital Signs. Twenty-nine per cent of patients had a tachycardia, but the presence of a tachycardia did not bear any constant relationship either to the degree of fever or the pathologic condition in the gallbladder. Thirty-six per cent had a significant temperature of 101°F. or greater at some time preoperatively; 43 per cent had a moderate temperature between 99° and 101°F.; 21 per cent had no fever at all. The magnitude of fever, or the lack of it, had no correlation with the patient's clinical course or the pathologic findings at operation.

Abdominal Findings. Tenderness was present in 90 per cent of patients. The right upper abdominal quadrant, again as might be expected, was the commonest location of tenderness, being involved exclusively or predominantly in 74 per cent. In three patients tenderness was well localized to the right lower quadrant, and four patients exhibited no abdominal tenderness at all.

Signs of peritoneal irritation, as reflected by the presence of rebound tenderness and decreased activity of the bowel sounds, were noted in 58 per cent. The location and referral of rebound tenderness usually correlated well with the localization of direct tenderness, but did not always agree with the patient's subjective localization of pain.

A palpable mass, thought by the examiner to represent the gallbladder, was found in 55 per cent. Some degree of abdominal distention was present in 29 per cent. Four patients were obviously jaundiced on admission, and in two others scleral icterus was present on the initial physical examination.

Roentgenographic Studies. Plain films of the abdomen were made preoperatively in twenty-three patients; in twelve patients (52 per cent) the findings were essentially within normal limits. In seven patients (30 per cent) a gas pattern was present which was consistent with a paralytic ileus. Calcific densities were present in the region of the gallbladder in two patients, and in one other patient a suspicious shadow was noted in the region of the gallbladder but could not be definitely identified as a gallstone. One patient exhibited a soft tissue shadow thought to represent the distended gallbladder.

Preoperative Management. Eleven patients, whose attacks of acute cholecystitis did not seem initially very severe or seemed to be subsiding when first seen, were managed "conservatively" on a regimen consisting of bedrest, nasogastric tube suction, antibiotics, antispasmodics and intravenous fluids. All of these patients who are included in this series

TABLE IV
POSTOPERATIVE COMPLICATIONS

Complication	No. of Patients	Per cent of Series
Fever (any after 3rd day)	3	8
Hypotension (systolic blood pressure under 100 mm. Hg at any time)	3	8
Paralytic ileus (after 24 hr.)	5	13
Atelectasis, pneumonitis	3	8
Thrombophlebitis	1	3
Jaundice (onset postoperatively)	1	3
Wound infection	2	5

TABLE V
OPERATIVE FINDINGS

Disease	No. of Patients	Per cent of Series
Uncomplicated acute cholecystitis	18	48
Empyema of the gallbladder	9	24
Gangrene of the gallbladder	5	13
Perforation of the gallbladder	6	16
Cholelithiasis	33	87
Adenocarcinoma of the gallbladder	1	3

naturally became worse under such treatment, and were then subjected to surgical exploration after periods varying from 24 to 384 hours following admission to the hospital.

For nineteen patients, in whom the acute cholecystitis clinically seemed more severe or seemed to be progressing when they were first seen, early surgical intervention was decided upon shortly after admission. A period, generally about twelve hours, was utilized to improve the patients' general condition prior to operation.

Rupture of the gallbladder, actual or impending, was feared in eight patients when they were first seen, and these patients underwent urgent exploration within a few hours of admission.

Operative Management. Local infiltration anesthesia was utilized in eight patients (21 per cent); the remaining thirty patients were given a general anesthetic. All operations were performed by residents. An attempt was made to remove all stones, especially those which might be lodged in the cystic duct or ampulla, but the common bile duct was not opened even in the presence of a palpable common duct stone if reflux of bile was obtained indicating patency of the cystic duct. A large soft rubber mushroom-type catheter (de Pezzar or Malecot) was used to drain the gallbladder through the fundus and was brought out via a subcostal stab wound. Soft rubber drains from the subhepatic space were brought out through separate stab wounds in the flank.

Postoperative Management. These patients generally presented no very unusual problems beyond those common to any group of aged surgical patients. Ambulation was often begun on the first postoperative day. The cholecystostomy tube was clamped on the twentieth postoperative day, on the average, and if no recrudescence of symptoms ensued, it was removed forty-eight hours later. Prior to removal of the tube, a cholecystocholangiogram is usually indicated. The average hospital stay was twenty-two days.

Postoperative complications occurred in thirteen patients (33 per cent), and are listed in Table IV. More than one complication occurred in some patients.

Pathology. The operative findings, based on the gross description and diagnosis of the surgeon, and sometimes confirmed by histologic examination of a biopsy specimen of the wall of the gallbladder, are listed in Table V. Gallstones were present in 87 per cent of our patients. A perforation of the gallbladder was present in 16 per cent. One case of adenocarcinoma was an unusual operative finding. Biopsy of the wall of the gallbladder at the time of cholecystostomy should be performed whenever possible. It was because of this simple maneuver that this unsuspected carcinoma of the gallbladder was discovered.

MORTALITY

There were no operative deaths. Six patients died postoperatively, a mortality rate of 16 per cent. In an attempt to discover those elements which might be significantly related to these postoperative deaths, several factors have been studied.

The presence of a perforation of the gallbladder leading to intrahepatic formation of an abscess or to peritonitis was associated with a fivefold increase in mortality. Delay on the part of the patient in presenting for treatment also seemed to be significant: beyond a delay

TABLE VI
POSTOPERATIVE RESULTS OF CHOLECYSTOSTOMY

Postoperative Follow-up Study		No. of Patients	Per cent of Group	Remarks
Group I	Recurrent chronic symptoms within first postoperative year (average follow-up period was 47 mo.)	10	100	53% of those who did not undergo cholecystectomy
	Subsequent surgery for recurrent acute disease	3	30	
	Postoperative deaths	1	10	Mortality rate—33%
	Continuing symptomatic	7	70	
Group II	Asymptomatic for first year following cholecystostomy (average follow-up period was 34 mo.)	9	100	47% of those who did not undergo cholecystectomy
	Subsequent surgery	0	0	
	Postoperative deaths	0	0	No mortality
	Late recurrence (4 yr.) of mild symptoms	1	11	
	Continuing asymptomatic	8	89	

of twenty-four hours there was a progressive increase in mortality risk, and among those few patients who delayed longer than ninety-six hours after the onset of the acute attack of cholecystitis before presenting themselves for treatment the postoperative mortality was increased threefold. These factors of perforation of the gallbladder and delay in seeking treatment are obviously related; the average period of delay among those patients who had a perforation was three times that of the series as a whole.

Postoperative deaths were more frequent among female patients; the reason for this sex difference is not clear, but it was not related to delay or perforation.

Age, previous history of gallbladder disease, the presence of chronic complicating disease states, preoperative management, type of anesthetic, and occurrence of local complications involving the wound or abdomen postoperatively were found to be insignificant factors in accounting for mortality.

SUBSEQUENT COURSE

Interval cholecystectomy was recommended to thirteen patients (40 per cent) who subsequently returned for this definitive surgery after an average period of two months. There were two postoperative deaths, a mortality of 15.5 per cent. One patient, a seventy-eight year old man, suddenly and unexpectedly became cyanotic and died on his third postoperative day; at autopsy no gross or histologic lesion was found to account for his sudden death. In the other patient, an eighty-four year old woman, massive diarrhea developed on the eighteenth postoperative day and she died within twenty-four hours despite vigorous therapy.

The subsequent course of the nineteen patients who refused or were not offered cholecystectomy is of interest. (Table VI.) Recurrent mild symptoms of chronic cholecystitis developed in ten patients (53 per cent) i.e., postprandial fullness and belching, continued intolerance to fatty foods, and most importantly, mild postprandial attacks of right upper abdominal tenderness, colic, or aching. In the majority of these patients, the recurrent symptoms appeared within a month postoperatively, and in all within the first year. Three of these patients have required subsequent cholecystectomy for recurrent acute cholecystitis with one postoperative death. This death occurred in an eighty-four year old woman in whom a massive right internal capsule cerebral infarction developed on the thirtieth postoperative day, and she subsequently died.

Nine patients (47 per cent) remained completely asymptomatic during the first year following cholecystostomy. Of these patients all but one have continued to be completely asymptomatic throughout the period of follow-up study. One patient had a subsequent mild attack of acute cholecystitis which responded rapidly to conservative therapy.

No deaths have occurred in these patients following cholecystostomy related to gallbladder disease except the one postoperative

death following cholecystectomy as noted previously.

THE QUESTION OF SUBSEQUENT CHOLECYSTECTOMY

The performance of elective cholecystectomy within a short interval following cholecystostomy is the ideal objective in the surgical management of acute cholecystitis. All patients who have undergone cholecystostomy should be regarded as potential candidates for subsequent cholecystectomy. But, certainly, not every one of these patients will require or will survive removal of the gallbladder. To which patients should we recommend subsequent interval cholecystectomy? The answer to this question cannot be stated in absolute terms, for each patient will require individual evaluation, taking into account the factors of age, life expectancy, operative risk and the extent of persistent biliary tract disease, against the background of accumulated surgical experience with the fate of the patient who does not undergo definitive treatment.

Gray and Lofgren [7], reviewing the experience at the Mayo Clinic, found that in thirty-eight patients sixty years of age or older who had undergone cholecystectomy, 72 per cent of those surviving the operation got along well and required no further surgical treatment for five years or until death; 28 per cent of their patients required further surgery, the majority within two years. There were no deaths due to biliary tract disease in their group of postcholecystostomy patients within the period of follow-up study.

Donald and Fitts [5], at the University of Pennsylvania, followed up for more than ten years sixty-five patients of all ages with acute cholecystitis who had been treated with cholecystostomy. Sixty-six per cent had a satisfactory result; 8 per cent had persistent symptoms, and 23 per cent required subsequent surgical treatment. Two deaths were related to biliary tract disease, and there were three deaths in eighteen patients similarly followed up who had undergone cholecystostomy for chronic cholecystitis. They recommended subsequent cholecystectomy in every patient who had undergone cholecystostomy "unless clearly contraindicated by the general condition of the patient."

Glenn and Hays [6,8], reporting the extensive experience at the New York Hospital, emphasized that cholecystostomy can rarely be considered definitive treatment, and that the "chances of subsequent symptomatic biliary tract disease are greater than 50 per cent" if the patient survives more than two years. They strongly advocated subsequent cholecystectomy except in those patients whose life expectancy is less than two years.

Hutchinson and Morton [10] surveyed a group of 400 patients who had undergone cholecystostomy without subsequent cholecystectomy at the Royal Infirmary, Glasgow. Fifty-three per cent of their patients were asymptomatic. However, 47 per cent were continuing to be troubled by symptomatic biliary tract disease and 11 per cent had undergone subsequent surgery, often under unfavorable conditions.

Clark and Livingston [3] were able to follow up fifty-three patients who had undergone cholecystostomy for acute cholecystitis. In their series, 60 per cent remained free of symptoms postoperatively; the remainder continued to have symptoms, and 6 per cent eventually required subsequent surgery. Eight per cent of their patients were found to have carcinoma of the gallbladder at subsequent operation or autopsy.

There is general agreement in the experience of others, and in the present series, that about a half of postcholecystostomy patients will require subsequent cholecystectomy. If we could select from among that group of aged patients considered poor surgical risks who have undergone cholecystostomy for acute cholecystitis those who will need to undergo cholecystectomy and operate only upon them, and, at the same time, not expose to the risk of operation those who will not need it, we could expect an improvement in our mortality from biliary tract disease. Of course, it is not possible to make such an absolute selection. However, in reviewing the postoperative clinical course of our cholecystostomy patients, we have been impressed that they seem to fall into two groups. In one group recurrent symptoms are noted usually within a month and in the vast majority within the first postoperative year. The subsequent course of these patients leads us to expect repeated attacks of acute cholecystitis and the subsequent necessity of cholecystectomy, often under the most unfavorable circumstances and, consequently, at an increased operative risk. Another group, however,

remain completely asymptomatic, and in these cases we would expect that the patients would generally do quite well for long periods, and will probably not need subsequent cholecystectomy.

We would make the following suggestions for managing the patient over sixty years of age who has undergone cholecystostomy for acute cholecystitis.

First, all patients who are reasonably acceptable surgical risks or become more acceptable risks through successful treatment of chronic degenerative diseases, should be offered subsequent interval cholecystectomy, preferably within two months following cholecystostomy. Patients in whom choledochal or cystic duct stones have not been removed at cholecystostomy run a high risk of recurrent acute attacks and should be most seriously considered for interval cholecystectomy.

Second, for those patients who are poor surgical risks cholecystectomy should be deferred and they should be followed up and observed. If they subsequently become symptomatic, then interval cholecystectomy should be recommended, realizing that the operative mortality in these patients will be higher, but that the over-all risks from untreated symptomatic biliary tract disease are greater than those of interval cholecystectomy.

Third, those patients considered poor surgical risks who remain asymptomatic should not be offered subsequent interval cholecystectomy; if they continue asymptomatic for over a year, then the prognosis for continuing without further trouble from the gallbladder is excellent.

SUMMARY

A report of thirty-eight aged patients who had undergone cholecystostomy for acute cholecystitis is presented; their clinical course and management are analyzed in detail. Particular emphasis is placed on the question of advising a subsequent cholecystectomy to such patients.

Subsequent interval cholecystectomy is not recommended in aged patients considered poor surgical risks if they remain asymptomatic following cholecystostomy.

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Polyps of the Colon and Rectum in Children

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POLYPS of the colon and rectum in children, although they occur infrequently, appear to be the most common hyperplasia of the large intestine in this age group [*5,7–17,23,26*]. The majority of authors agree that these lesions are benign [*2,3,5,9–12,16,17,24,26,28*], yet a few cases of carcinomatous changes have been reported [*7,13,14,20,26*]. According to Gordon et al. [*7*], nine out of their fifty-eight pathologically examined cases showed carcinoma *in situ*. In Kennedy's series [*14*], 55 per cent were adenocarcinomas. Some clinicians believe that polyps may undergo malignant changes and be precursors of cancer in later life.

It is our purpose to report on the so-called juvenile polyps examined in our laboratory during the past seven years, review the literature and discuss the diagnosis, treatment and evolution of these lesions.

METHOD AND MATERIAL

The case histories in the University Hospital (1956 to 1958), and in the private files of one of us (1951 to 1958), of all children found to have juvenile polyps of the large intestine were reviewed. The familial type of polyposis and submucosal growths were excluded.

The records of thirty-two patients, two to fourteen years of age, were studied (Table 1). Two had eliminated the polyps spontaneously, and the material was not brought to the laboratory. Details of this study are presented herein.

Incidence. Since routine rectosigmoidoscopy is usually not used in pediatric patients it is difficult to estimate the actual incidence. In postmortem material, Helwig [*11*] found an incidence of 3.5 per cent in the first decade of life and 2.5 per cent in the second decade in a series of 449 consecutive autopsies. Bokay [*12*] discovered only 0.5 per cent in 60,000 postmortems in children. We found three cases in 558 children from birth to fifteen years of age.

Our reports of pediatric postmortems were divided according to the age of the patients as follows: perinatal and neonatal, 352; first decade, 198, second decade, eight. If we exclude those in the perinatal and neonatal period, we are left with reports on 206 postmortems. Two of the cases occurred in patients seven and eight years old, and one in a patient thirteen years old.

In a total of 115,398 children examined, Schapiro [*23*], found 2,700 cases of proctologically determined disease and among these an incidence of 3.74 per cent of rectal or colonic polyps. Among 349 children with rectal or colonic symptoms, Kerr [*15*] found 100 with juvenile polyps. Rider et al. [*22*], in a series of 7,487 patients of all ages in which routine examination was performed, found an incidence of 0.4 per cent for the first decade and 1.5 per cent for the second decade. Gordon et al. [*7*] reported one case in every 1,500 (0.07 per cent) pediatric admissions. If newborn infants are excluded, this figure becomes less than 0.1 per cent. Pennington [*12*] found twenty-five cases in 58,970 children. Turell and Maynard [*30*] examined 105 boys and girls with the rectosigmoidoscope and encountered two cases.

TABLE 1
INCIDENCE BY AGE AND SEX

Sex	Age in Years							Total
	1–2	3–4	5–6	7–8	9–10	11–12	13–14	
Males.....	0	5	5	3	1	1	1	16
Females.....	1	4	4	1	3	2	1	16
Total.....	1	9	9	4	4	3	2	32

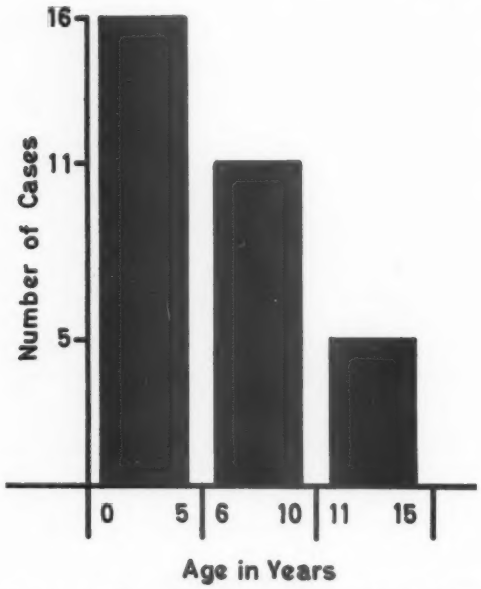


FIG. 1. Incidence of polyps by quinquenniums of age.

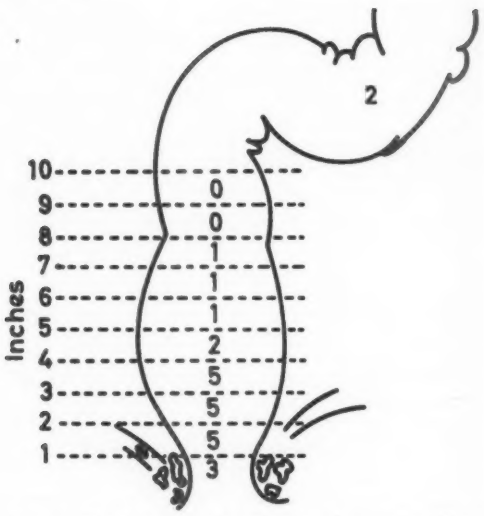


FIG. 2. The location of polyps in the rectum (data available include twenty patients and twenty-five polyps).

Mentzer [*19*] reviewed 147 consecutive cases of anorectal inflammatory disease and found seven cases. Hall [*9*] discovered nine cases in a two-year period. Church and Schwartz [*5*] reported two cases.

Age and Sex. The age of fifteen years was chosen as the upper limit for our series because lesions with histologic and clinical characteristics of juvenile polyps were seen up to this age. However, the typical pathologic microscopic features of the juvenile polyp have been described in patients nineteen years old [*12*], twenty-one years old [*12*] and twenty-four years old [*15*]. Sixteen cases occurred in the first five years, eleven cases in the second five years, and five cases in the third quinquennium. (Fig. 1.)

TABLE II
DISTRIBUTION AND NUMBER OF POLYPS

Distribution	No. of Cases
Single	24
Scattered	23
No data available	5
Total	32

The youngest patient in our series was twenty-four months old and the oldest fourteen years old. The greatest incidence occurred between four and eight years of age. The number of males and females was equal. Of the 680 cases reported in the available literature [*2,5,7,9,10,12–17,22–25*] only 415, including our thirty-two cases, are classified according to sex. This data included 241 boys (60 per cent) and 174 girls (40 per cent). The greatest number of cases occurred from three to six years of age with a peak at ages three to four years, the youngest patients being four months, six months, nine months and one year old [*12,21,25*].

Site and Number. Polyps were categorized, following the method of Gross [*8*], as single and scattered (Table II). The latter refers to isolated lesions in the rectum, colon or ileum, each unit of which can be treated locally. Of the twenty-seven patients about whom data were available, twenty-four had single polyps and three had scattered lesions (two had two polyps, and one had three). Kerr [*15*] states that 68 per cent of the polyps in his series were solitary adenomas. When more than one polyp was present in a patient, the number usually was not more than two or three [*10,12*]. Gordon et al. [7] believe that figures of ten to 100 polyps probably represent cases of diffuse polyposis. Figures 2 and 3 show the localization

of the polyps. Most of them were found 1 to 4 inches (2.54 cm. and 10.16 cm.) from the anorectal junction.

ASSOCIATED DISEASES OF ANUS AND RECTUM

None of the polyps in our series were associated with hemorrhoids. The latter, although they occur in children, seem to occur infrequently in this age group (0.25 per cent of 2,700 patients with proctologic diseases, according to Schapiro) [23]. This is of clinical importance, since polyps in children are almost constantly associated with bleeding. Prolapse was found in three cases.

Intestinal Parasites. All of the eleven children in whom parasitologic examination was performed were infected by protozoa, metazoa, or both. In order of frequency the parasites were as follows: Endamoeba coli, 6; Giardia lamblia, 4; Ascaris lumbricoides, 2; Endamoeba histolytica, 1; Endolimax nana, 1; Chilomastix mesnili, 1; Strongyloides stercoralis, 1; Necator americanus, 1. These infections, however, do not appear to have etiologic significance. There were no reports in the literature reviewed [6–8,10,12,14–17,21,23–25, 29] of the coexistence of intestinal parasitism and rectal or colonic polyps in childhood.

Other Findings. A thorough study of the clinical data failed to demonstrate any relationship between the development of adenomas and maternal diseases or accidents during pregnancy, the type of nutrition, or the development of childhood diseases. Of the twelve patients for whom a blood count, hematocrit and hemoglobin were determined, nine had mild anemia and only three had severe anemia. Of eight cases investigated, three were blood relatives and the father of one of them had had polyps removed from the colon. Church [5] believes that chronic constipation and faulty bowel habits with constant straining on defecation may be the etiologic agent of intestinal redundancies, and that polyps develop from or on this redundancy.

SYMPTOMS

In our series the symptoms (Fig. 4), in order of frequency, were as follows:

1. Hemorrhage of fresh bright blood, which usually occurred during defecation. The feces were streaked or covered with blood, but not mixed with it. This appears to be of diagnostic significance, since blood is mixed with feces when bleeding is from higher levels, as in a Meckel's diverticulum. The actual amount of blood was described as abundant in thirteen cases and scanty in fifteen cases. There was no bleeding in one case. In two cases, although bleeding had occurred, the amount was not noted. None of the patients needed blood transfusion.

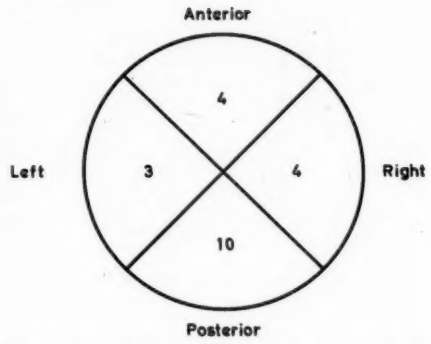


FIG. 3. Localization of polyps (data available include twenty-one polyps).

2. Procidentia of the polyp was quite frequent (seventeen cases). It was observed by the parent or guardian, or by the child himself, and described as "finger-like," "piece of sponge," or "cherry-like."

3. Diarrhea was noted in ten patients and constipation in two. Mucus was often present (nine patients).

4. Abdominal pain, either colic or diffuse, was present in seven cases.

5. Proctalgia was encountered in four cases, and spontaneous amputation of the neoplasm occurred in two cases. This seems to be rather frequent in children [10,12,15,26]. Andren and Frieberg [2] reported two cases in which there was spontaneous regression of polyps of the colon in children.

6. Rectal prolapse was seen in two patients, and tenesmus in two patients, in whom no E. histolytica was demonstrable.

7. Other less common symptoms cited in the literature are abdominal discomfort and intestinal obstruction due to intussusception. The literature shows similar findings as to occurrence and frequency of symptoms [7,10, 12,15,26].

DIAGNOSIS

Juvenile polypoidosis is to be suspected in the presence of painless rectal bleeding, and

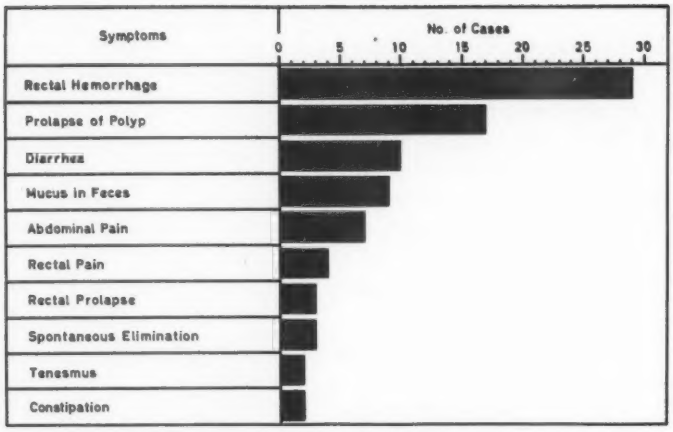


FIG. 4. Symptoms occurring among thirty patients with polyps.

verified in a large percentage of the cases by the appearance of a mass at the anal orifice (Table III). Digital examination was positive in twenty-one out of twenty-eight patients so examined, emphasizing the importance of this type of examination. Bergen [4] believes that the entire rectum and rectosigmoid region can be explored more adequately by the examiner's finger than by either the proctoscopic or roentgenologic examination. The physician can often "milk down" the mucous membranes so that he can feel lesions beyond the reach of the sigmoidoscope and well up into the sigmoid.

Rectosigmoidoscopic examination was performed without sedation in most of the patients and the adult sigmoidoscopic apparatus was used. Rectosigmoidoscopy revealed polyps in twenty-two out of twenty-three patients examined. The finding of a solitary lesion requires further search, since three of the twenty-three patients examined had more than one polyp. Rectosigmoidoscopy is a very valuable diagnostic procedure and can be used safely, regardless of the child's age, whenever the clinical symptomatology indicates its use. We do not believe, however, that this procedure is indicated in every patient with intestinal symptoms regardless of the symptomatology. This is in contrast with the examination of adults, for whom its use is advised during any general examination. Of the twenty-three cases in which roentgenologic examination was used, only ten showed positive findings. Double contrast examinations performed using the technic described by Andren and Frieberg [1], however, appears to give reliable and accurate diagnoses, even of very small lesions.

TABLE III
METHODS OF EXAMINATION AND FINDINGS

Procedure	No. of Patients Examined	Positive Findings (No. of Patients)	Negative Findings (No. of Patients)
Digital rectal examination	28	21	7
Rectosigmoidoscopy	23	22	1
Barium enema	23	10	13

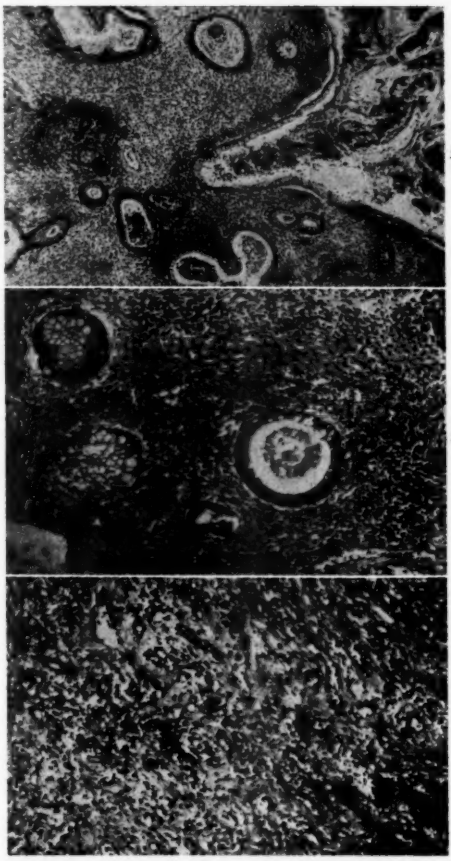
PATHOLOGY

The polyps varied from 0.5 to 3 cm. in diameter. Twenty-six were pedunculated. They were firm, pink, and on section most of them had a cystic appearance with mucoid contents. Microscopically, there was a proliferation of both glandular and stromal elements. The stroma was preponderant and appeared to be infiltrated by mononuclear and polymorphonuclear leukocytes. Eosinophils were abundant and rather constant. Vascularization was prominent. Active secretion and normal mitotic figures, some of them dilated, with a flattened epithelial layer, forming real cysts filled with mucus and occasionally containing cellular debris and polymorphonuclear leukocytes were seen in the glands. There was focal hemorrhage and necrosis of

some of the polyps. Their histologic appearance is so characteristic that they can be distinguished from the adult adenomatous polyp on microscopic grounds. (Figs. 5 A, B and C.)

Horrilleno et al. [12] question whether or not these lesions are true neoplasms. Helwig [11] believes they are true adenomas. In our opinion some appear to be inflammatory but some are true adenomas, both macroscopically and microscopically. Gordon et al. [7] believe that they are adenomas which may become malignant, although their progress is slow, and invasive malignancy is rare before puberty. Their criteria for a diagnosis of cancer are as follows: (1) stratification of epithelial cells with hyperchromatic nuclei; (2) mitotic activity; (3) absence of goblet cells; and (4) the presence of large nucleoli. The presence of any three of these was considered sufficient for the diagnosis of malignancy. If we apply these criteria to our cases, we find one polyp which may be considered carcinoma *in situ*. Nevertheless, we are inclined to use the same criteria for these polyps that Warren [27] and Meissner [28] employ for adult adenomas. The diagnosis is based on anaplasia, irregularity of architecture and invasion. At least two of the factors are required for the diagnosis of malignancy. Definitive invasion of lymphatics or blood vessels, when an artifact can be ruled out, is a sufficient basis for the diagnosis of cancer. Applying the previously mentioned criteria, we cannot consider any of the polyps which we examined to be carcinoma vera.

One of our cases had an evolution of nine years, one of five years, one of four years, and four of three years. None of them showed malignant changes. It is well to remember that Mayo and de Castro [18] reported a carcinoma of the sigmoid, which arose from a polyp seen fifteen years previously, and we have in our files a report of a similar case in which the evolution was eight years.



5A

5B

5C

FIG. 5A. Juvenile polyp showing dilated glands filled with mucoid material, cellular debris and inflammatory exudate. Hematoxylin and eosin stain. Original magnification × 36.4.

FIG. 5B. Juvenile polyp showing abundant stroma. Hematoxylin and eosin stain. Original magnification × 36.4.

FIG. 5C. Juvenile polyp showing vascular stroma. The inflammatory infiltrate is also visible. Hematoxylin and eosin stain. Original magnification × 104.

TREATMENT

In spite of their benignity polyps should be removed, hemorrhage being the main indication for surgical intervention. When they could be reached through the sigmoidoscope, they were surgically removed and their base was or was not fulgurated according to the surgeon's preference. Only six patients required general anesthesia. Polyps located beyond the reach of the sigmoidoscope were removed through laparotomy and colotomy. Only one patient had a slight hemorrhage (for twenty-four hours) but did not require further treatment.

The patients should be examined periodically for recurrence. Fifteen of our patients were followed up, but a new lesion was discovered in only one. We are not sure whether this lesion was present at a previous examination or represented a new adenoma.

SUMMARY AND CONCLUSIONS

Clinical data on thirty-two children under fifteen years of age, with juvenile polyps, have been presented. Rectal or colonic polyps appear to be the most frequent cause of painless rectal bleeding in children.

The value of roentgenographic examination is limited. For this reason it should be repeated until the physician is completely satisfied, or special technics are to be more widely employed. The patients who did not eliminate the polyps spontaneously were treated by local surgical removal of the tumor, with or without fulguration of the base.

Juvenile polyps, either single or scattered, require only local resection. Their microscopic appearance and clinical evolution are characteristic enough to constitute a separate group.

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The Importance of Porosity in Vascular Prostheses

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In recent years, many synthetic materials have been used experimentally and clinically to replace segments of blood vessels. The difficulties in obtaining and preserving arterial homografts and the fate of many of these grafts has made their use less popular than the synthetic substitutes. A continued search for the most suitable synthetic material with which to replace arterial segments has been the subject of much investigation. The ideal synthetic graft must have many properties. Permeability or porosity is one of the most important. The object of this paper is to more clearly define the reasons that make porosity an important feature of a synthetic vascular graft.

Compressed Ivalon® (polyvinyl alcohol) tubes were used to replace a segment of the abdominal aorta in dogs. This material was used as porosity is minimal when the sponge is compressed into a smooth-walled, solid tube. The reaction in the surrounding soft tissue compares favorably with the other synthetic substitutes. (Fig. 1.) Because of the lack of porosity, there is little ingrowth of fibroblasts through the wall of the graft. A hyalinized intimal lining is formed which is easily damaged, especially in the center of the graft. The lining, graft, and outer fibrous covering are only loosely attached and are easily separated from each other. Any break in continuity of the fragile intima could quickly result in dissection of this lining from the graft with subsequent thrombosis or hemorrhage.

METHOD

Blocks of Ivalon sponge were allowed to dry and slices 3 to 5 mm. in thickness were cut. These were wrapped around glass tubes 7 mm. in diameter and compressed by wrapping tightly with rubber sheeting. They were then boiled for thirty minutes in a sterilizer. This procedure produced smooth-walled, flexible tubes with a wall 1 mm. thick.

Adult mongrel dogs were used. The animals were anesthetized with intravenous sodium pentobarbital. An intratracheal airway was inserted to allow free respiratory exchange.

The abdomen was entered through a lower left paramedian incision. The terminal aorta was mobilized and a segment 2.5 cm. in length was excised between Potts clamps. This was replaced by a 3.5 cm. segment of Ivalon sponge graft. Four interrupted, everting mattress

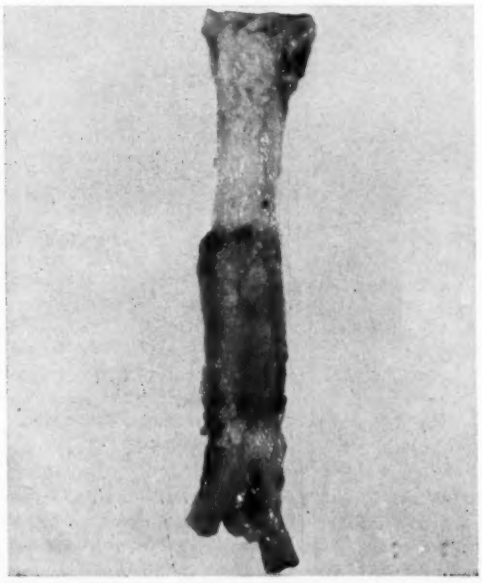


Fig. 1. Minimal fibrous tissue reaction to Ivalon graft.

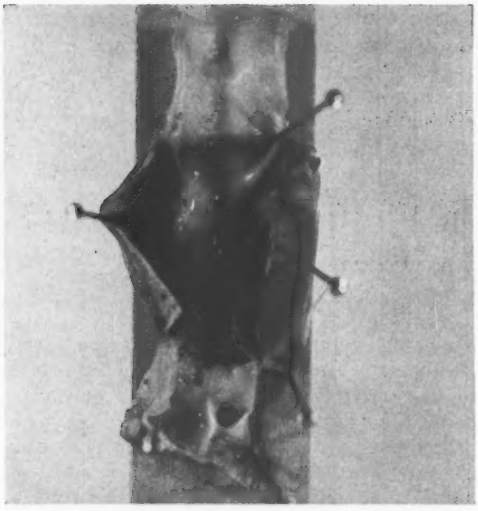


FIG. 2. Separation of intimal lining, graft, and outer fibrous covering.

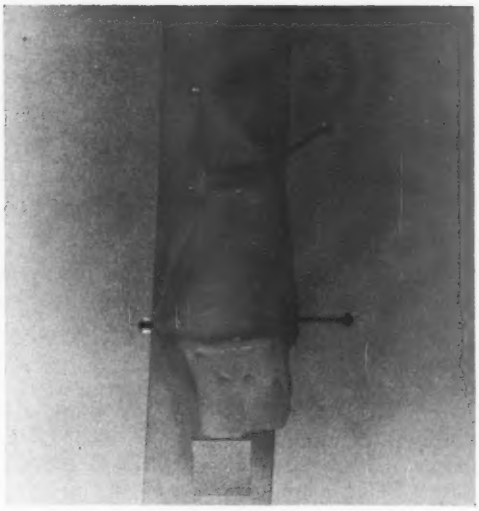
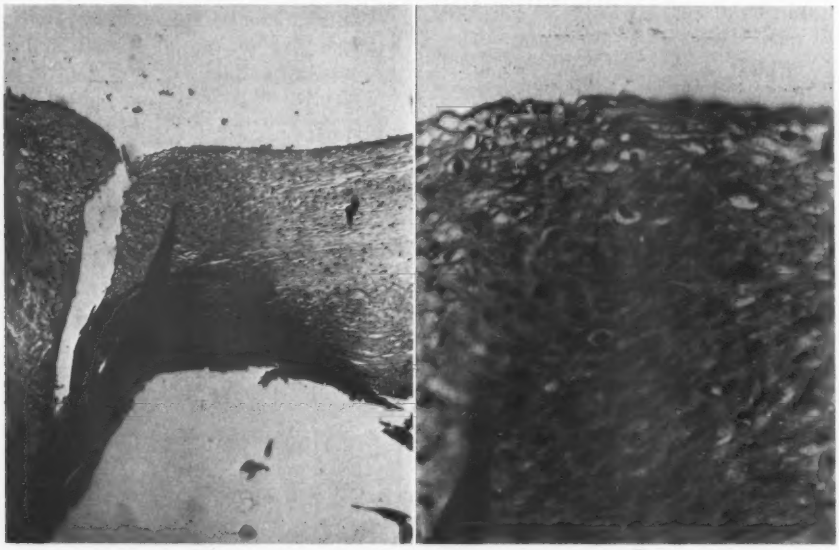


FIG. 3. Fibrous tissue ingrowth from ends of graft with persistence of hyalinized membrane in center.



4A 4B

FIG. 4. Microscopic appearance of fibrous tissue growing in from end of graft. A, original magnification × 100. B, original magnification × 500.

sutures were placed equidistant from each other in each anastomosis. The four quadrants created in each end were sutured with an over-and-over continuous suture of No. 5-0 arterial silk. All dogs were given penicillin for three to five days postoperatively. They were followed until death by complications or sacrifice at which time autopsy was performed. All grafts were studied closely in the fresh state. Microscopic sections were made in order to study the nature of the intimal lining at the center and at the ends of the grafts.

RESULTS

Grafts were placed in fourteen dogs. Two of these dogs were lost but lived at least one month postoperatively. Two others died at three months and one year postoperative but were not autopsied. These four are excluded from Table 1. The remaining ten were autopsied following death by sacrifice or other cause. Of these ten remaining dogs, one died immediately from hemorrhage due to rupture of the suture line. Another died more than a year after surgery. The cause of death was not determined by autopsy. Six of the grafts remained patent and three were occluded. In all of the six which were patent, the graft was easily separated from both the intimal lining and the outer fibrous covering. This is well demonstrated in Figure 2. The three layers have separated at the cut edge. In two of those which were occluded the intimal lining was contracted to form a narrow cord of tissue, being attached to the graft only at the anastomotic line at each end. In one the thrombus completely filled the lumen of the graft but was easily separated from the graft. In all of the grafts which remained patent, the intima consisted of a very thin, fragile, hyalinized lining which tore easily. The center of the lining was consistently the more fragile part. Fibrous tissue grew in from each end of the graft leaving the center as the weakest area in which the hyalinized membrane persisted. (Figs. 2 and 3.) Fibroblasts infiltrate this hyalinized membrane at each end of the graft and replace it with a fibrous tissue intima which is stronger and less likely to break down.

TABLE 1
STATUS OF GRAFTS AT AUTOPSY

Dog No.	Follow-up (days)	Cause of Death	Autopsy Findings
2	402	Killed	Graft loosely adherent; patent
3	395	Killed	Graft loosely adherent; patent
4	431	Died; cause not determined	Graft loosely adherent; patent
5	1	Died; hemorrhage	Rupture of suture line
8	30	Killed	Graft loosely adherent; patent, but lumen narrowed
9	171	Killed	Lumen occluded; intima detached
11	125	Killed	Lumen occluded; intima detached
12	97	Killed	Graft loosely adherent; patent
13	90	Killed	Graft loosely adherent; patent
14	62	Killed	Thrombosis of graft

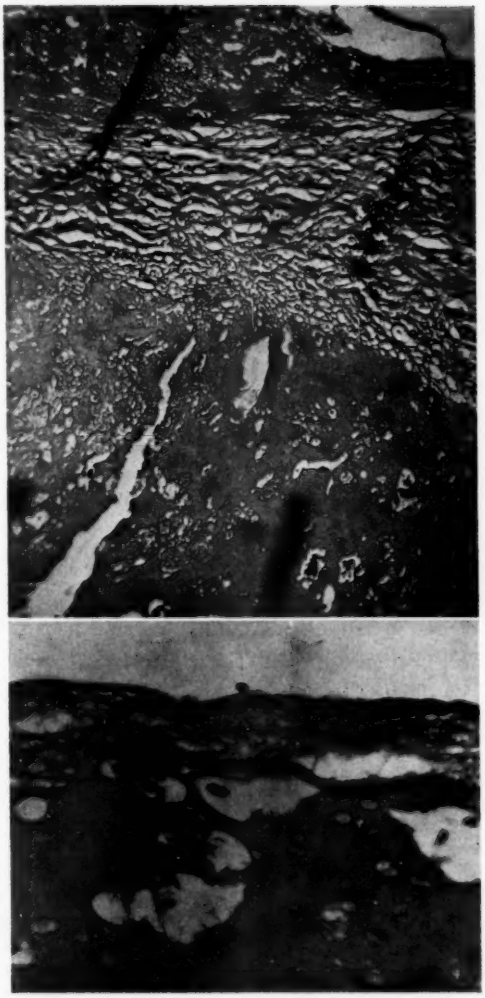


FIG. 5. Microscopic appearance of hyalinized membrane persisting in center of grafts. *Top*, original magnification × 100. *Bottom*, original magnification × 500.

(Figs. 4A and B.) In Figure 5 a section of the hyalinized membrane without fibroblasts can be seen.

COMMENTS

This study supports the view that the property of porosity is extremely important as the growth of fibrous connective tissue through the interstices of the synthetic graft affixes the graft to the surrounding tissues and intima and

strengthens the intima by fibrous infiltration. This is in accord with the report of the committee for the study of vascular prostheses [1].

A pseudo-intima is first formed by fibrin which subsequently becomes hyalinized. This hyalinized membrane gradually becomes organized with fibrous tissue which grows in from the ends of the graft. During the period of organization of the hyalinized membrane, the lining of the graft is fragile and tears easily. It is true, as suggested by Knox and Begg [3], that the formation of an intimal lining is not dependent on porosity. Their view that porosity may not be essential to the efficient functioning of a cloth prosthesis as a vascular graft must be opposed here as this study indicates that a lack of porosity can predispose to an easily damaged intima resulting in dissection of the intima from the graft. In a similar experiment with Ivalon, Harrison [2] found this fibrin layer which had not been infiltrated by fibroblast to be ragged and thick and associated with numerous thrombi. In dogs which he observed for six months there were bare areas where portions of the lining had apparently become detached. It can only be concluded that proper healing of a synthetic graft can take place only when there is ingrowth of fibrous tissue through the interstices of the material used as this properly affixes the graft to the surrounding tissue and allows early fibrous organization of the intima. This intima is affixed to the graft by the fibrous tissue ingrowth through the interstices.

SUMMARY

Segments of the abdominal aorta of adult mongrel dogs were replaced with compressed Ivalon (polyvinyl alcohol) tubes to determine the importance of porosity in vascular prostheses. The status of these grafts was determined at varying periods of time postoperatively and the results were summarized. The lack of interstices through which fibrous tissue could infiltrate the wall of the prosthesis resulted in the formation of a hyalinized intimal lining which was slowly replaced by fibrous tissue which grew in from the ends of the graft.

This hyalinized membrane was fragile and damaged easily. The outer fibrous covering, the graft, and the intima could be easily separated. It is concluded that porosity is an important feature of a vascular prosthesis as it allows early fixation of the graft and early fibrous organization of the intima. Ivalon seems not to be the most suitable prosthesis from this standpoint.

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Benign Neoplasms of the Stomach

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BENIGN gastric neoplasms have attracted increased attention during recent years. In the past, textbooks have described such lesions as uncommon or rare and as seldom encountered except at necropsy. However, benign neoplasms of the stomach are often detected by the radiologist and are occasionally found by the surgeon at the time of laparotomy for unrelated diseases. The management of these tumors requires an understanding of their behavior. Because there seems to be some disparity in published accounts of the incidence, treatment and malignant potential of the various benign neoplasms of the stomach, a review of the experience at The New York Hospital has been undertaken. This report covers the period from 1932 through March 1959. The material which is presented is based on the findings from ward patients, and a histologic diagnosis was made in all but nine by surgical biopsy or excision, or by autopsy. In the nine, the clinical picture was reasonably typical to warrant inclusion in the series.

INCIDENCE

During the twenty-six-year period which is covered by this study, 104 benign gastric neoplasms were found among 171,708 patients who were admitted to the ward services of The New York Hospital. Sixty-nine were from patients on the clinical services and thirty-five were detected by autopsy. The sixty surgical specimens from the sixty-nine patients represent less than 1 per cent of all the patients with gastric neoplasms who were treated during the same period.

The incidence of benign gastric neoplasms differs in various reports. Stewart [*20*] reviewed 11,000 reports of findings on autopsy from the University of Leeds Hospital and noted forty-seven cases with gastric adenomas. In 28 per cent of these, the papillomas were malignant or coexisted with gastric carcinoma.

More recently, Meissner [*16*] examined the stomach of fifty cases found on autopsy, selected at random, and found forty-four leiomyomas present in twenty-three specimens. Dudley and his associates [*5*] reviewed 456 operations for gastric neoplasms at Bellevue Hospital from 1935 to 1938 and found benign tumors in 1.3 per cent. In a review of the experience of the Lahey Clinic, Marshall [*14*] stated in 1952 that approximately 2 per cent of gastric neoplasms were benign.

CLASSIFICATION

Customarily, benign gastric neoplasms were classified according to their histogenetic origin. In most reviews leiomyomas have been found to occur with the greatest frequency. However, in the present series adenomas comprised the preponderant type of benign tumor of the stomach. (Table 1.) It may be noted that most of these were obtained by surgical approach while leiomyomas were found with approximately equal frequency at the time of surgery and autopsy.

Benign gastric neoplasms other than adenomas and leiomyomas are unusual. These uncommon lesions accounted for 9.6 per cent in our group and seven were lipomas. One of these was a tumor of aberrant pancreatic tissue and the appropriateness of inclusion of this may be questioned. One neurofibroma and one carcinoid complete the distribution of histologic types in the series.

The various types of lesions will be discussed in separate sections because they present differences in clinical behavior as well as structure.

ADENOMAS

The presence of gastric adenomas was established clinically in forty-two patients. Twenty-

†Dr. Pearce died on March 22, 1960.

TABLE I
MORPHOLOGIC CLASSIFICATION OF 104 BENIGN GASTRIC NEOPLASMS. THE NEW YORK HOSPITAL (1932–1959)

Type of Neoplasm	Source of Specimen	
	Surgery	Autopsy
Epithelial		
Adenoma		
Single	26	3
Multiple	16	5
Mesenchymal		
Leiomyoma	23	21
Lipoma	3	4
Neurofibroma	0	1
Heterotopic tissue		
Aberrant pancreas	1	0
Miscellaneous		
Carcinoid	0	1
Total	69	35

TABLE II
SYMPTOMATOLOGY ASSOCIATED WITH GASTRIC ADENOMAS

Symptoms	No. of Patients
Weight loss	14
Epigastric pain	13
Anorexia	11
Weakness	5
Melena	4
Vomiting	4
Fullness	3
Hematemesis	2
Nausea	2
Fatigue	1

seven of the patients were women and fifteen were men. Their ages ranged from forty-eight to seventy-eight years with an average of sixty-six and a half years. The adenomas were single in twenty-six patients and multiple in sixteen.

Symptomatology. Clinical study led to detection of the gastric adenomas in thirty-four patients before operation was performed. Symptoms, present in all but five of these patients, could be interpreted as manifestations of the gastric lesion. (Table II.) Loss of weight, epigastric pain and anorexia were most frequently noted. The duration of symptoms varied from one day to five years prior to admission to the hospital. Hematemesis occurred in one patient who sought treatment the following day. The majority had symptoms for two to six months before the diagnosis was made.

Gastric adenomas were incidental findings in eight patients who had abdominal operations. Adenomas were found in five specimens that had been removed for carcinoma of the stomach and in three with peptic ulceration. In these, the symptoms from the primary disease process would obfuscate any manifestations of the associated adenomas.

Diagnostic Studies. Eleven patients in this group (approximately one-fourth) had pernicious anemia. In five, the gastric lesion was detected at the time that gastrointestinal roentgenograms were obtained as part of the periodic study. Ten of the eleven patients were women and six were in hematologic remission at the time that the adenoma was found.

The diagnostic studies which were performed most often included blood count, examination of the stools for gross and occult blood, determination of gastric acidity, radiographic examination of the stomach, gastroscopy and cytologic examination of gastric washings.

Mild to severe degrees of anemia were found in twenty-two of the thirty-four patients who had gastric adenoma without any other gastric lesions. Eight had hemoglobin levels which ranged from 10 to 13 gm. per cent. Eight had hemoglobin levels of 5 to 10 gm. per cent while two had less than 5 gm. per cent.

Gastric acidity was determined in twenty-six patients and twenty-two had achlorhydria on stimulation with histamine. Only one patient was found to have normal acid values. Blood was present in the stools of thirteen of twenty-eight patients who had this study.

Radiologic examination of the upper gastrointestinal tract was performed in thirty-one patients. The radiologist reported benign adenomas in twenty-seven instances which were confirmed by operation. (Fig. 1.) Polypoid lesions which were considered to be carcinoma but were demonstrated to be benign on histologic study after removal were found in the cardia in two patients. In two instances roentgenograms of the stomach failed to demonstrate adenomas which were later detected at the time of laparotomy.

Gastroscopy was used as a diagnostic aid in thirteen patients in the series, but a correct diagnosis was made in only six. The adenoma was not visualized in two, and in two others it was thought to be a carcinoma. In three the examination was unsatisfactory for technical reasons.

Exfoliative cytologic study of the gastric aspirate was performed in fifteen patients, with either the abrasive balloon or chymotrypsin technics. In one patient the aspirate was unsatisfactory for diagnostic purposes. A false-positive report was obtained in one patient whose lesion was benign when examined by the surgical pathologist.

Treatment. Operative procedures were performed on twenty-six of the thirty-four patients in whom a clinical diagnosis of gastric adenoma had been made. Three patients were not considered suitable candidates for surgical intervention because of advanced age, severe cardiac disease and active pulmonary tuberculosis. Five patients refused to have operations.

Operative therapy consisted of partial gastrectomy in thirteen, local excision in twelve and exploratory laparotomy on one. A comparison was made of the surgical treatment prior to and subsequent to 1950. During the first eighteen years which were covered by this study, local excision was performed in nine patients and partial gastrectomy in only two. In the eight year interval after 1950, adenomas were removed by partial gastrectomy in eleven instances and by local excision in only three. All of the operations were accomplished without mortality.

Of the twenty-six patients subjected to operation, twenty-two are living without evidence of recurrent tumors two months to twenty-one years following surgical treatment. Four patients from this group have died of unrelated diseases. Eight patients were not operated upon. Of these, three are living eleven, twelve and eighteen years following diagnosis and do not have symptoms directly attributable to the tumors. One patient, who refused to have an operation, has the same symptoms one year after the diagnosis was made. Three patients have been lost to follow up. One patient died of an unrelated illness two years after the lesion was detected.

In the group of twenty-six patients who were treated by operation, additional adenomas have been found to have developed in one patient.

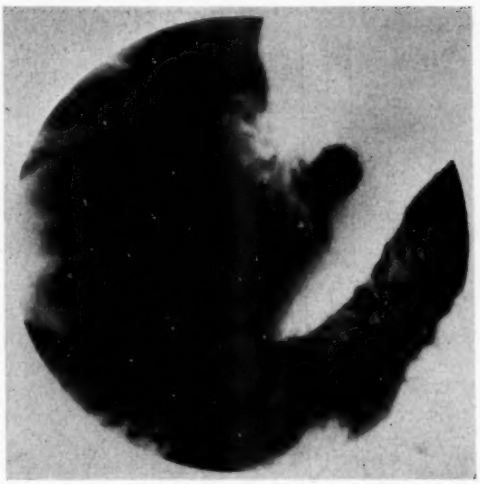
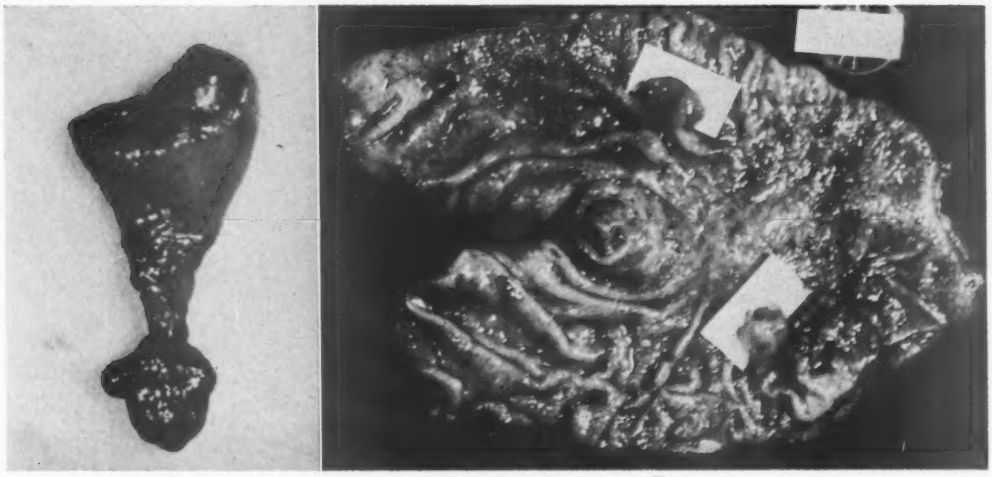


FIG. 1. Roentgenogram (spot film) of the stomach of a seventy-two year old man showing gastric adenoma. The patient (No. 2986) was free of gastric symptoms and the lesion was discovered during study to determine the cause of fever of unknown origin.

This was a fifty-two year old woman who had an adenoma removed locally from the antrum of the stomach in 1939. She was asymptomatic for four years, then epigastric pain and anorexia recurred. Roentgenograms demonstrated two adenomas in the gastric antrum. Partial gastrectomy was performed and she has been free of symptoms and without roentgenographic evidence of adenomas for fifteen years.

Pathological Considerations. Adenomas are epithelial tumors which arise from the glandular elements of the mucosa of the stomach. There is a marked tendency to papillary formation as in similar lesions of the large intestine and these might similarly be called papilloma or papillary or pedunculated adenomas. The submucosa and the muscularis mucosae of the base of the papilloma is usually attenuated, drawn into a long stalk by the force of peristalsis. (Figs. 2A and B.) Grossly these tumors vary markedly in size and are usually fleshy, soft and greyish pink. When sessile they may cover a large portion of the inner surface of the stomach. Microscopic examination may demonstrate varying degrees of pleomorphism and numbers of mitoses, but these features do not indicate malignancy as long as the connective tissue stalk or the muscularis mucosae is not invaded. The cells lining the glands of the adenoma differ from those in the



2A 2B

FIG. 2. A, a pedunculated gastric papilloma. This surgical specimen was removed by local excision. B, two gastric adenomas were demonstrated in the specimen which was obtained by partial gastrectomy.

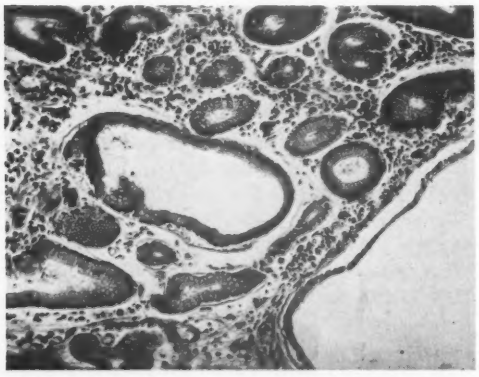


FIG. 3. Photomicrograph of gastric adenoma. Hematoxylin and eosin stain. Original magnification × 140.

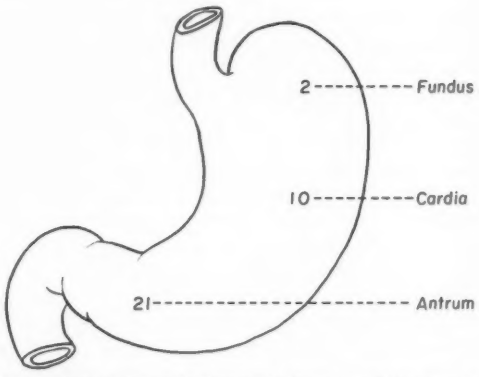


FIG. 4. The diagram indicates the location of the gastric adenomas in the present series.

glands of the surrounding stomach in that they are all of one type, usually a mucus producing goblet cell similar to the mucus producing columnar cells or "gland neck cells" of the stomach. (Fig. 3.) There is no differentiation into parietal cells, chief cells or argentaffine cells as in the normal gastric mucosa.

The size and location of the adenomas could be determined in thirty-three instances. (Fig. 4.) The most frequent site of the tumors was in the antrum where twenty-one were found. Ten were in the cardia and two in the fundus. There did not seem to be predilection for the greater or lesser curvatures or for the anterior or posterior walls. The papillomas ranged from 4 mm. to 6 cm. in diameter. Six were described as polypoid and ten as polypoid and pedunculated. Seven had a broad base or were sessile. Adenomas were multiple in two of the three instances in which malignant changes were found and these were of small size. In one case there were five antral adenomas, the largest of which was 5 mm. in diameter. Four sessile antral adenomas were present in the second case, and the largest measured 2.2 cm. The third patient in whom malignant changes were found had a single sessile adenoma 1 cm. in diameter in the cardia. One of these patients had pernicious anemia known to be present for eight years and in remission at the time of discovery of the

adenoma. Multiple adenomas were found in association with carcinoma in four of the five patients. All of these were located in the antrum and measured from 0.5 to 2 cm. in diameter. The gastric carcinoma was also located in the antrum in four of the five patients and was present in the fundus and cardia in one. In the latter patient, the adenoma was in the antrum and was benign.

The adenomas which showed microscopic evidence of malignant change measured 0.5 to 1.5 cm. in diameter. Thus, the size does not correlate with the presence or absence of malignancy in gastric adenomas.

In contrast to the frequency with which gastric adenomas were encountered in the surgical cases, there were only eight instances reported from the cases found on autopsy during the same period. These eight patients ranged in age from forty-one to seventy-two years with an average age of sixty-three years. Three of these patients had single adenomas measuring from 2 to 8 mm. in diameter which were found in the "silent areas" of the cardia and fundus of the stomach. Two of these patients had pernicious anemia, but none had had any gastrointestinal symptoms. All died from causes unrelated to the adenomas. The other five patients were found to have multiple adenomas of the stomach and of these, three were associated with carcinoma.

BENIGN MESENCHYMAL NEOPLASMS

This group of neoplasms arises from derivatives of the embryonic mesoderm which includes muscle, fat and nerve tissue. In the present report, this category constitutes 38 per cent of the entire series.

LEIOMYOMAS

The most common benign gastric neoplasm of mesenchymal origin is the leiomyoma. It was the most common benign gastric tumor found at autopsy and ranked second in frequency among surgical specimens. Leiomyomas have been reported by Ackerman [*1*] to be the most frequently encountered benign gastric neoplasms of the stomach and Meissner [*16*] stated that their incidence closely approximates that of uterine leiomyomas.

In the present series, twenty-three patients were found to have gastric leiomyomas at the time of operation and twenty-one at the time of autopsy. These lesions occurred approximately twice as often in men as in women. Thirty of the patients were men and fourteen were women. Those patients whose leiomyomas were treated surgically were from forty to seventy-four years of age with an average age of sixty years. The ages of the autopsy subjects ranged from forty-six to eighty-three years with an average age of sixty-six years.

TABLE III
SYMPTOMATOLOGY ASSOCIATED WITH GASTRIC LEIOMYOMA (NINE PATIENTS)

Symptoms	No. of Patients
Weight loss	8
Epigastric pain	6
Nausea	5
Melena	2
Abdominal mass	2
Vomiting	2
Anorexia	1

Clinical Findings. Only nine of the twenty-three patients whose leiomyomas were detected at the time of operation had symptoms that seemed to be related to the neoplasm. In fourteen instances, the benign tumor was an incidental finding at the time of surgical intervention for an unrelated condition. Loss of weight, epigastric pain, and nausea were the most frequent symptoms in the nine patients. (Table III.) Melena had been noted by only two patients. Symptoms could not be attributed to the leiomyomas in any case of those found at the time of autopsy from review of the charts.

An abdominal mass was present in three patients, and in two, the mass had first been noted by the patient. This is in contrast to the absence of abdominal findings in the patients with gastric adenomas.

Mild to moderate degrees of anemia were found in six of the symptomatic patients. Hemoglobin levels ranged from 8.0 to 11.8 gm. per cent. Occult blood was present in the stools of five patients. Gastric analysis with the administration of histamine was performed in seven and achlorhydria was found in three. Gastric cytology was reported to be negative for malignant cells in the four instances in which this study was made.

Roentgenograms of the upper gastrointestinal tract (Fig. 5) provided the correct preoperative diagnosis in only one patient and were reported as being within normal limits in

FIG. 5. Roentgenograms of the stomach showing a large filling defect in a sixty-six year old woman (No. 163940) who complained of epigastric pain of seven weeks' duration. The radiologic diagnosis was "probable carcinoma of gastric cardiac." Surgical pathologic report was leiomyoma of the stomach.

another. An extragastric mass of undetermined nature was said to be present in two patients. The radiologic report was carcinoma in three patients and gastric papilloma in two.

Treatment. Operation was performed in the nine patients who had symptoms attributable to gastric leiomyomas. In four, partial gastrectomy was performed with one postoperative death. Three patients were treated by local excision without operative mortality. In two instances, the diagnosis was established by biopsy. One of these patients was thought to have a large retroperitoneal malignant neoplasm which could not be removed. Death occurred in the postoperative period.

In fourteen patients, leiomyomas were found at the time that laparotomy was performed for other diseases. The primary process was benign peptic ulcer in six, biliary tract disease in five, carcinoma of the stomach in two and carcinoma of the esophagus in one. The leiomyomas in

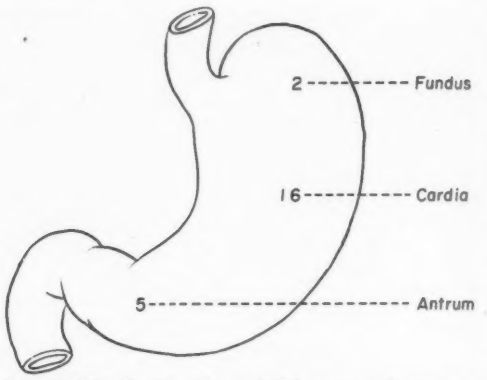


FIG. 6. Distribution of gastric leiomyomas in twenty-three patients in the present series is diagrammatically outlined.

these patients seem to have been asymptomatic and did not recur after removal.

Pathologic Considerations. Gastric leiomyomas vary markedly in size. In the present series, the smallest was 5 mm. in diameter and the largest 21 cm. The smallest symptomatic leiomyoma was 3 cm. in diameter. Among the leiomyomas which were removed surgically, symptoms were associated with all tumors that measured more than 6 cm. in diameter. Among those found at autopsy, the tumors varied from a few millimeters to 3 cm. in diameter.

The distribution of leiomyomas in the stomach among those patients who were treated surgically is depicted in Figure 6. Sixteen of the tumors were located in the cardia, while only five were found in the antrum and two in the fundus. Palmer [17] reported from a review of the literature that 65 per cent of leiomyomas are found in the cardia and antrum.

Gastric leiomyomas are usually firm and often lobulated and pedunculated. They are yellow or tan in color. The location of leiomyomas within the wall of the stomach may be submucosal, intramural or subserosal. In some instances, leiomyomas may extend in both the submucosal and subserosal planes and thus form "hour-glass" or "dumb-bell" tumors. Submucosal or intramural leiomyomas tend to distort the overlying gastric mucosa and with increase in size the resulting attenuation of the mucosa may lead to atrophy and ulceration. (Fig. 7.)

Although leiomyomas appear to be circumscribed, they are not truly encapsulated. This is a distinguishing characteristic in differentiation

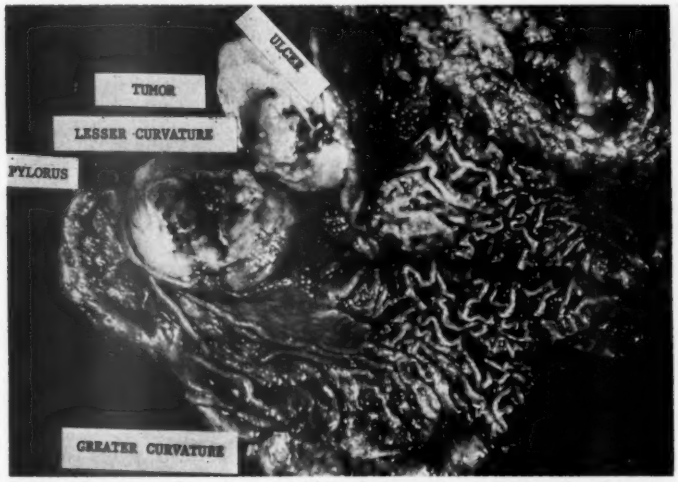


FIG. 7. The surgical specimen which is depicted demonstrates the ulceration that may occur in gastric leiomyomas.

between neurilemmomas which have a true capsule.

Microscopic examination discloses smooth muscle cells arranged in interlacing bundles and whorls together with fibrous tissue which is varying in amount but is usually scant. (Fig. 8.) Many tumors contain a striking palisading of the nuclei similar to that seen in the common leiomyoma of the uterus and indeed these gastric myomas are often indistinguishable from a "fibroid." As in the latter neoplasm, there may be a striking pleomorphism of the nuclei. Large, dark, bizarre nuclei can be scattered abundantly throughout the mass and yet not indicate malignancy. A few mitotic figures can sometimes be found in the absence of metastases but these should not cause concern.

The malignant potentialities of benign neoplasms of the smooth muscle have been a subject of controversy. Stewart [20] has questioned the possibility of malignant transformation of leiomyomas and stated that he has not seen an example of sarcoma arising in such a benign lesion. The bizarre histologic appearance of many leiomyomas has been noted by Stout [21] who has urged caution in making a diagnosis of sarcoma unless mitotic figures are numerous or invasion is present. However, Ackerman [1] considers excessive cellularity or necrosis to be indications of malignancy. He reported two neoplasms that had a benign microscopic appearance but a malignant clinical course.

Results of Treatment. Evidence of recurrence has been found in one of the three patients who were treated by local excisions. He is a fifty-one year old man from whom an "hourglass" leiomyoma in the gastric antrum measuring 5 cm. was removed. It had resulted in mucosal ulceration and melena. He suffered from two episodes of melena after operation and roentgenograms have demonstrated a filling defect in the distal portion of the stomach. This may be another tumor arising independently of the first rather than a true recurrence. The patient has refused further operative treatment. Recurrence has not been detected in the remaining patients who were treated by excision or by partial gastrectomy.

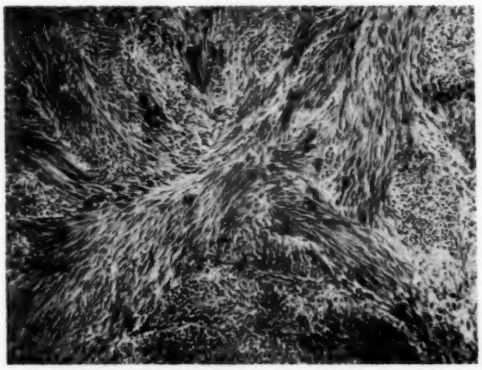


FIG. 8. Photomicrograph of gastric leiomyoma. Hematoxylin and eosin stain. Original magnification × 140.

FIG. 9. Photograph of surgical specimen (Case II) illustrates the submucosal location of the gastric lipoma, which was present in the antral portion of the stomach.

LIPOMA

Gastric lipomas are rare. Palmer [17] was able to find reports of only ninety-five cases and of these thirty-two were from patients who were operated upon. These neoplasms are characteristically single, submucosal in location and more than half are in the antrum. The clinical manifestations are bleeding and pyloric obstruction.

Seven patients with gastric lipomas have been treated at The New York Hospital. Three were in surgical patients and four were detected at autopsy as incidental findings. The three lipomas which occurred in patients who were treated by surgical means produced symptoms in each instance. The patients, one woman and two men, were fifty-seven, sixty-one and sixty-six years of age. Because these neoplasms are uncommon, short case reports are presented.

Case I: A fifty-seven year old woman (No. 419532) complained of severe epigastric pain with vomiting of five weeks' duration and a loss of weight of ten pounds over a two year period. Physical examination revealed a movable, non-tender mass measuring 5 cm. just above the umbilicus. Laboratory studies revealed a hemoglobin value of 12.5 gm. per cent and stools positive for occult blood. Gastric analysis demonstrated free acid to be present. Roentgenograms of the stomach were reported to demonstrate carcinoma of the gastric antrum. Laparotomy was performed on October 3, 1945 and a submucosal mass measuring 6 cm. in diameter was found in the antrum with overlying mucosal ulceration. A partial gastrectomy was performed. The pathologic diagnosis was lipoma. The patient was well and without symptoms five years after the operation.

Case II: A sixty-six year old man (No. 537907) was admitted to the hospital because of anorexia and loss of weight for one year with occasional epigastric pain, nausea and vomiting. Physical findings were within normal limits. Hemogram and urinalysis were within the normal limits. Gastric analysis demonstrated acid values within the normal range, and stools contained occult blood. Roentgenograms of the stomach were reported to demonstrate a papilloma of the antrum with prolapse into the duodenum. When operation was performed, a submucosal mass measuring 2 cm. in diameter was found which was attached to the greater curvature of the antrum. (Fig. 9.) A partial gastrectomy was performed on May 9, 1949 and the lesion was reported to be a lipoma by the surgical pathologist. The patient was well two years later.

Case III: A sixty-one year old man (No. 649063) had episodes of epigastric pain, nausea and vomiting, and occasional tarry stools for three years. Admission was for treatment of hematemesis. Pallor of the mucous membranes was the only significant physical finding. The hemoglobin value was 7.5 gm. per cent, stools were strongly positive for blood, free acid was absent after the administration of histamine on gastric analysis. Roentgenograms of the upper gastrointestinal tract demonstrated only a duodenal diverticulum. When operation was performed on February 27, 1953, a lipoma measuring 4 cm. in diameter was found in the antrum and was removed by local excision. The patient remained free of gastric complaints but died from rectal carcinoma three years later.

The four lipomas that were found at the time of autopsy were from 1 to 2 cm. in diameter. Three were submucosal and were located in the antrum. One was found in the gastric cardia and was intramural. One lipoma was found in a patient with gastric carcinoma and one in a patient with carcinoma of the esophagus.

As is the case in other locations the microscopic appearance of these tumors does not distinguish them from normal fat and it is the gross mass of adipose tissue in an abnormal location which leads to the diagnosis of lipoma. Although well localized, they had no distinct capsules.

NEUROFIBROMA

Gastric neurofibroma may occur as an isolated lesion or as part of generalized neurofibromatosis (von Recklinghausen's disease).

Forty-one cases of solitary gastric neurofibromas have been reported by Palmer [17]. The diagnosis is seldom made before operation and approximately one-fourth of the cases have been found at the time of autopsy. These tumors are spheroid, encapsulated, variable in size, usually submucosal and are found in the cardia of the stomach. Ulceration of the overlying mucosa results in gastrointestinal bleeding in some.

The single gastric neurofibroma in the present series was encountered in a seventy-five year old white woman. Emergency laparotomy was performed for volvulus of the small intestine. There had been no previous gastrointestinal complaints. She died in the immediate postoperative period and an autopsy was performed. An encapsulated neurofibroma which measured 6.5 by 3 cm. was found in the cardia of the stomach. It was submucosal and there was ulceration of the overlying mucosa. (Fig. 10.)

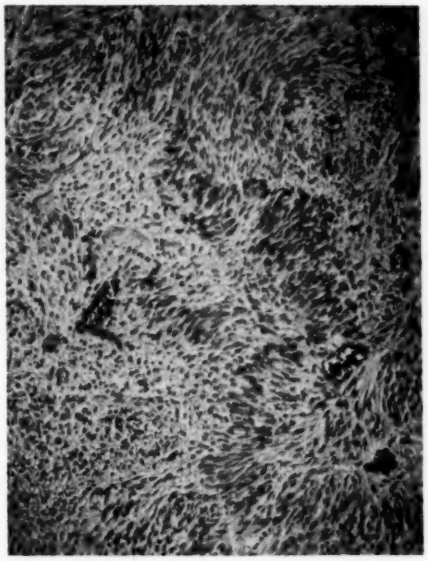


FIG. 10. Photomicrograph of neurofibroma of the stomach. Hematoxylin and eosin stain. Original magnification × 140. Palisading of the nuclei is shown in this section.

HETEROTOPIC OR ABERRANT PANCREAS

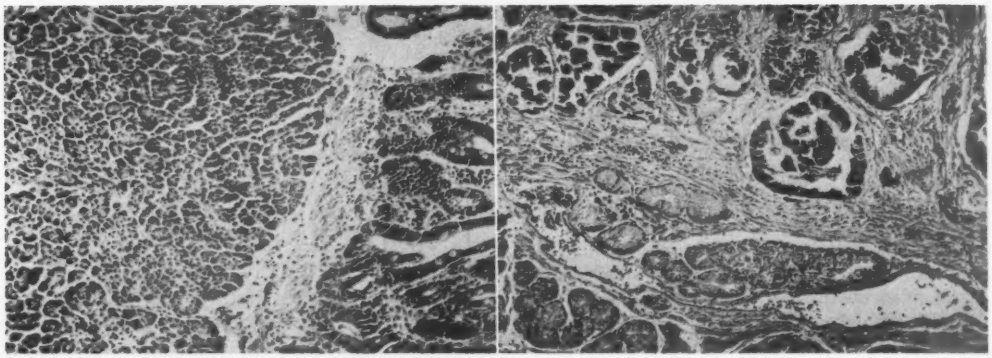
This lesion is included in the report although it is not a true neoplasm. However, this lesion presents as a tumor clinically and must be considered in the differential diagnosis of benign tumors of the stomach which are encountered at the time of operation.

The only patient in the current series with aberrant pancreas in the stomach had the lesion discovered at the time of operation. A forty-five year old man was admitted to the hospital for pain in the right upper quadrant of the abdomen of two years' duration. Cholecystography demonstrated cholelithiasis, which was confirmed at the time of operation. In addition a rubbery intramural tumor 2 cm. in diameter was palpated in the gastric antrum. Cholecystectomy and partial gastrectomy were performed. The tumor was firm, its cross-section was yellow and the overlying mucosa was intact. Microscopically, the lesion was found to be an intramural leiomyoma with an associated large nest of pancreatic glands. (Fig. 11A.) The patient has been free of gastrointestinal complaints for two years.

Of the 215 reported cases of aberrant pancreas which involved the stomach, slightly more than one-half (120) have been found during surgery. These tumors are located in the antral or pyloric region of the stomach in the majority (85 per cent) and are submucosal in approximately three-fourths. The most characteristic finding is a ductal orifice which tends to umbilicate the tumor sufficiently to be discernible by radiography or gastroscopy. The tumor is microscopically an adenoma which is composed of differentiated glands and ducts. Islets usually are not seen. These tumors may be involved in many of the disease processes which affect the pancreas, such as acute and chronic pancreatitis, and formation of cysts. Ackerman [1] has reported two cases of carcinoma which arose from aberrant pancreatic tissue. Massive hemorrhage has been reported to occur from such lesions. However, aberrant pancreatic tissue in the stomach usually causes symptoms when it becomes large enough to obstruct the pylorus. It may also be a cause of severe, atypical abdominal pain in middle-aged males [17].

CARCINOID OF THE STOMACH

This enigmatic neoplasm is infrequently found in the stomach. The isolated example in the present series was an incidental finding during autopsy examination. The patient was a fifty-one year old white man who died of myocardial infarction, and without a record of gastrointestinal complaints. An ill-defined thickening was found in the pyloric region of



11A 11B

FIG. 11. A, the heterotopic pancreatic tissue is shown in the submucosal layer of the stomach in this photomicrograph. The gastric glands are present on the right side of the photograph. B, shows carcinoid of stomach. The darkly stained glands in the upper portion of the picture represent the argentaffine tumor. The small pale glands are the pyloric glands of the stomach. Hematoxylin and eosin stain. Original magnification × 140.

the stomach which was found to be a carcinoid when examined microscopically. (Fig. 11B.) A pedunculated submucous lipoma 1.5 cm. in diameter was present in the antrum.

Lattes reported five cases of carcinoid of the stomach in 1956 at which time he was able to find thirty-five cases reported in the world literature [12]. Fifteen of these were incidental at the time of autopsy. The malignant potentiality of these lesions has been emphasized in most reports. Christopherson [3] stated that metastases were present in 22 per cent of gastric carcinoids. In the same report he noted that metastasis occurred in 38 per cent of extra-appendiceal carcinoids.

Carcinoid tumors arise in the argentaffine cells (Kulchitsky cells) which are found in the gastric pits in varying numbers in normal persons. The neoplasms are usually round or oval in shape, are located in the submucosa and frequently cause ulceration of the adjacent mucosa. The cut surface of a carcinoid is usually yellow because of intracellular lipoid deposition. They may or may not be well circumscribed.

Microscopically they are composed of small nests and cords of cells which are cuboidal and regularly arranged. The characteristic argentaffin granules may be demonstrated by means of the Fontana-Masson stain. The microscopic appearance does not correlate with the clinical course, benign or malignant.

The symptoms which are most frequently associated with carcinoids are epigastric pain, loss of weight, and bleeding. However, the correct diagnosis is seldom made prior to operation. Because carcinoids may be multiple, a careful search of the gastrointestinal tract should be made when a carcinoid is discovered.

COMMENTS

Since the radiologic demonstration of a gastric adenoma in 1911 [22], roentgenograms have continued to be the standard means for diagnosis of this neoplasm. While the majority of patients with gastric adenomas present symptoms of weight loss, epigastric pain and anorexia, it is notable that some are symptomatic. The use of the gastroscope has been of limited diagnostic value because the existence of these benign tumors is not suspected in those in whom this examination might contribute the greatest aid. Thus accuracy in diagnosis has advanced little in the past decade or two.

The malignant potential of gastric adenomas is uncertain. The association of these benign lesions with gastric carcinoma suggests a relationship. Furthermore, among patients with gastric adenomas, pernicious anemia has been present with striking frequency. The increased incidence of gastric cancer among pernicious anemia patients has been documented. However, the prolonged survival of untreated patients who have adenomas in the stomach, such as those in the present series, raises serious question concerning the threat of malignant transformation in these tumors. The chief con-

cern remains one of differential diagnosis when a gastric tumor is found. Size, location and configuration do not distinguish accurately between adenoma, leiomyoma and carcinoma in a significant number of instances. It is advisable, therefore, to remove such neoplasms and establish the nature of the gastric tumor by microscopic examination. Partial gastrectomy is preferred because it removes the lesion adequately, lessens the chance of reappearance of adenomas, and is appropriate therapy if malignant changes are present.

Leiomyomas of the stomach are associated also with diagnostic difficulties. The symptomatology which is related to pyloric obstruction and bleeding resembles that of other neoplasms of the stomach. In some typical lesions the radiologic diagnosis is reasonably accurate. However, the present series illustrates the incorrect assessment of many, despite multiple clinical and laboratory studies. The malignant potential of these neoplasms also invites speculation. It does appear that growth is slow and that malignancy, if present, is low-grade. Local removal with a margin of normal gastric wall may be adequate therapy in most of the benign mesenchymal lesions; however, partial gastrectomy may be required because of size and location. The technical simplicity of removal of such lesions when discovered incidentally at the time of laparotomy seems to justify excision. The danger of bleeding or pyloric obstruction warrants surgical extirpation of symptomatic leiomyomas.

SUMMARY

A study of the experience with 104 benign gastric neoplasms has been presented. Adenomas were found most frequently and were present in fifty patients. Leiomyomas, which numbered forty-four, represented the next largest group. Adenomas and leiomyomas accounted for 90.3 per cent of the benign neoplasms of the stomach.

The clinical manifestations of gastric adenoma are similar to those of carcinoma of the stomach. Twenty-six per cent occurred in patients with pernicious anemia. Partial gastrectomy is recommended as surgical treatment.

Leiomyomas were associated with symptoms in only nine patients. Thirty-five were found incidentally at either operation or autopsy. Local excision is usually adequate therapy.

Other benign gastric tumors consisted of seven lipomas and one instance each of neurofibroma, aberrant pancreas and carcinoid. In common with other benign gastric neoplasms, there are few distinguishing clinical characteristics and the diagnosis must be made by gross or microscopic examination.

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Surgical Procedures to Revascularize the Heart

A REVIEW OF THE LITERATURE

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CORONARY artery disease presents a major challenge to modern surgery. This is exemplified by the many technics which have been devised to provide the diseased heart with an adequate blood supply. These methods will be presented separately and have been categorized into four basic approaches which are: (1) production of a new arterial blood supply; (2) production of venous stasis or reversal of coronary circulation; (3) indirect methods to improve myocardial circulation; and (4) direct surgical attack on the coronary arteries. (Table I.)

TABLE I
SURGICAL PROCEDURES DESIGNED TO INCREASE THE BLOOD SUPPLY OF THE HEART

I. Production of a new arterial blood supply to the heart
   A. Production of adhesions between the epicardium and pericardium
   B. Use of flaps or pedicle grafts
   C. Transplantation of an arterial vessel or graft directly into the myocardium
II. Production of venous stasis or reversal of the coronary circulation
   A. Occlusion of the coronary sinus
   B. Arteriolization of the reversed coronary circulation
III. Indirect methods of improving the blood supply of the heart
   A. Operations on the sympathetic nervous system
   B. Total thyroid ablation
   C. Ligation of the internal mammary arteries
IV. Direct surgery of the coronary arteries
   A. Coronary endarterectomy
   B. Substitution of a graft for the obstructed segment of coronary artery
   C. Direct anastomosis of other vessels or grafts to the coronary arteries
   D. Resection of infarcted myocardium

TECHNICS TO PRODUCE A NEW ARTERIAL BLOOD SUPPLY TO THE HEART

Production of Adhesions between the Epicardium and Pericardium. The first procedure which involved a direct surgical approach to increase the collateral blood supply to the heart was described by Beck et al. [*34*] in 1935. This operation was designed to utilize the normally existing extracoronary anastomoses between the heart and pericardium which had been described by Hudson et al. [*82*] and Moritz et al. [*107*]. A sterile pericarditis was produced by mechanical abrasion of the epicardium and inner surface of the pericardium. The adhesions which developed between the two surfaces enhanced the anastomotic channels [*20,21,34*].

In 1929 Beck [*16*] experimentally produced a chemical pericarditis by the intrapericardial injection of Dakin's solution (chlorinated soda), but concluded that it was not safe for clinical use. Not until 1943 did Beck, in association with Schildt and Stanton [*132*], report the clinical application of the chemical method of creating a sterile pericarditis for which asbestos was used as the irritant.

In 1939 Heinbecker and Barton [*80*] and

Heinbecker and Slome [*81*] published a technic of inducing a sterile pericarditis by chemical means. The cardiopericardiopexy was performed by injecting sodium moohuate, lionite (aleuronat), or carborundum sand into the pericardial cavity following which the retrosternal tissues were sutured to the pericardium.

In the same year Thompson [*138*] reported the creation of cardiopericardial adhesions by direct application of talc (magnesium silicate) to the surface of the heart. Plachta et al. [*121*] and Thompson and his group [*139–141*] have employed this procedure extensively in clinical practice. In a review of fourteen years' experience, 90 per cent of the cases were reported to have received 50 per cent improvement and 40 per cent improved more than 75 per cent [*139*].

Dack and Gorelick [*47*] reported a series of thirty-six patients with coronary artery disease, 75 per cent of whom exhibited good to excellent clinical improvement following a Thompson cardiopericardiopexy. They recommended its use for patients with hypertensive heart disease associated with cardiac hypertrophy and congestive failure, and in selected patients with rheumatic heart disease [*69*]. Harken et al. [*79*] modified Thompson's technic by de-epicardializing the myocardium with 95 per cent phenol solution prior to application of the talc. Consistent relief from intractable angina pectoris with no operative deaths was reported in eighteen patients thus treated.

In an experimental study published in 1956, Grice and his associates [*71*] demonstrated that shredded asbestos placed in the pericardial space would afford the experimental animal significant protection against subsequent coronary occlusion.

Flaps or Pedicle Grafts

Mediastinal Fat or Retrosternal Tissues. In 1935 Beck et al. [*33*] postulated that cardiopericardiopexy would be more effective if the blood supply to the pericardium was augmented. This was accomplished by attaching the pericardial fat and mediastinal tissues to the pericardium. He demonstrated that, when this collateral vascular bed was present, almost total occlusion of both coronary arteries could be effected with survival of the experimental animal. Similarly, Heinbecker and Barton [*80*] and Heinbecker et al. [*81*] grafted the retrosternal tissues to the pericardium after creating a chemical pericarditis by their injection technics.

Skeletal Muscle. Operation upon the human heart to increase the myocardial blood supply was first performed by Beck [*17,18*] in February 1935. Subsequent to mechanical abrasion of the epicardium, a pedicle graft composed of the pectoralis major muscle was sutured directly to the myocardium. Increasing success with this procedure was obtained in a series of twenty patients [*19*]. Cardiomyopexy has recently been reappraised experimentally by Bakst and his group [*9*]. To increase the adhesions between the myocardium and the pectoral muscle, magnesium silicate was applied to the opposing surfaces.

Skin and Subcutaneous Tissues. In an attempt to restore nourishment to the ischemic heart, Neumann et al. [*115,116*] and Von Wedel et al. [*152*] demonstrated that tubed pedicle grafts of skin and subcutaneous tissue could be successfully grafted to the myocardium of experimental animals.

Omentum. A technic of cardio-omentopexy was described by O'Shaughnessey [*118*] in 1936 in which the omentum was grafted either directly to the epicardium or pericardium subsequent to production of a chemical (aleuronat) pericarditis. Clinical success with this operation was reported in a number of patients.

Lung. The lung was first employed as a source of collateral blood supply to the heart by Lezius [*95,96*] in 1937. A window of pericardium was excised, acriflavine applied to the myocardium, and the adjacent lung tissue sutured to the myocardium. In 1949, Carter et al. [*41*] devised a technic of cardiopneumopexy in which the lingular segment of the left upper lobe was sutured to the pericardium after asbestos paste was inserted intrapericardially. Improvement was observed in four of five patients treated in this manner. A modification was designed by Reimann et al. [*123,124*]. Consistent signs of improvement with no operative deaths were observed in eight patients.

Other technics of performing cardiopneumonopexy have been evaluated experimentally. Garamella et al. [*64*] performed a segmental resection of the lung, debrided the epicardium with 30 per cent acriflavine, then grafted the pulmonary segmental cleavage surface to the myocardium. Based on reports that ligation

of the pulmonary artery would increase flow of the bronchial artery, Kline et al. [87] occluded the left pulmonary artery before producing adhesions between the lung and myocardium with the application of silver nitrate. Kownacki [89] attempted to increase pulmonary collaterals by ligating the lingular vein prior to grafting the lingular segment to the heart.

Jejunum. Key et al. [85] employed a jejunal pedicle graft to revascularize the myocardium. An isolated loop of jejunum with its blood supply intact was delivered through the diaphragm, its mucosa stripped and the denuded surface sutured to the epicardium. Baronofsky [13,14] and Hannon et al. [78] modified this technic by suturing the free end of a Roux–Y jejunal segment to the heart muscle. In a series of seventy-three dogs, cardiojejunopexy revealed evidence of significant protection against death and infarction as compared with controls and dogs in which other revascularization technics had been applied, i.e., coronary sinus ligation and cardiopneumopexy. Cardiojejunopexy has not been applied clinically.

Stomach. A technic of cardiogastropexy was devised by Minor and Hipp [105] in which an isolated segment of stomach wall was grafted to the myocardium. Numerous technical problems were encountered in this experimental study, and clinical application has not been attempted.

Transplantation of an Arterial Vessel or Graft Directly into the Myocardium

Internal Mammary Artery. In 1938 Griffith and Bates [73] published the account of an operation performed for treatment of coronary artery disease in which the ventricle was accidentally perforated. To close the defect, a portion of pectoral muscle, in which the branches of the internal mammary artery had been preserved, was sutured into the opening. The original studies of ventricular transplantation of the internal mammary artery as a method of myocardial revascularization were reported by Vineberg [143] in 1946. Anastomotic channels between the transplanted vessel and the coronary artery system have been observed in 50 to 73 per cent of the experiments [144,147,150].

Since the first clinical experiments were reported in 1952, Vineberg and co-workers [145,146,148,149,151] have frequently reviewed the results of this operation. In a series of eighty-eight patients, 85 per cent of the grafts remained patent with relief of angina pain observed in 75 per cent of the patients; 79 per cent were able to return to work. The mortality rate was 5.6 per cent.

Bakst et al. [12] was unable to demonstrate experimental evidence that implantation of the internal mammary artery provides a significant increase in the blood supply to the heart. Glenn et al. [65] compared the newly-formed anastomoses with the vessels found in granulation tissue which tend to disappear in six to eight weeks. However, Vineberg et al. [146] and Bencosme et al. [35] have presented histologic evidence that the branches which develop are true arteries capable of transporting a significant quantity of blood to the myocardium. In an experimental study in which the carotid artery was implanted into the myocardium, Sabiston and Fauteax [129,130] demonstrated that arterial transplants provide definite protection against subsequent ligation of the coronary artery.

Subclavian Artery. Fuquay and his associates [63] transplanted the left subclavian artery into the heart muscle experimentally. The results indicated that the subclavian artery will deliver an increased blood flow with greater protection against infarction than the internal mammary artery.

Splenic Artery. Bloomer et al. [37] have evaluated a technic in which the splenic artery is implanted into the ventricular wall.

Left Ventricular Chamber. Goldman et al. [68] devised a method of revascularization whereby blood from the left ventricle was channeled into the myocardium through a U-shaped or straight free graft (carotid homograft). Substitution of polyethylene tubing to replace the homograft was unsatisfactory. Significant protection against experimental coronary occlusion was obtained even when the grafts became thrombosed. Utilizing the same principle, Massimo and Boffi [101] placed the horizontal limb of a T-shaped plastic tube in the ventricular wall with the vertical branch directed into the chamber. Experimental application revealed favorable results.

Left Auricular Chamber. In an attempt to use blood from the left auricle as a source of the collateral blood supply, Enria et al. [55] inserted the left auricular appendage into the

ventricular wall. The results of this technic were not described.

Thoracic Aorta. A method was devised by Smith et al. [*135*] whereby a prosthetic device or a homologous graft which had been anastomosed to the thoracic aorta was implanted into the myocardium. This operation has been successful in one patient.

PRODUCTION OF VENOUS STASIS OR REVERSAL OF CORONARY CIRCULATION

Occlusion of the Coronary Sinus. The use of venous blood to increase the myocardial blood supply was first suggested by Wearn et al. [*153,154*] who postulated that the thebesian veins could supply the heart muscle with blood directly from the ventricle in the presence of major coronary occlusion. In 1934 Robertson [*127*] attempted to nourish the myocardium with venous back flow by experimental ligation of the cardiac vein. This technic was modified by Gross and Blum [*75*] who produced venous stasis by complete coronary sinus occlusion. Further investigation revealed that partial occlusion would afford significant protection against subsequent coronary ligation without causing the high mortality rate which occurred following total coronary sinus occlusion [*76*]. These observations were corroborated by Gregg and Dewald [*70*].

In 1937, Fauteux [*56,57*] described the technic of segmental pericoronary neurectomy which was combined with ligation of the companion vein and later modified to include ligation of the vena magna cordis. Many reports have described the symptomatic relief provided by this operation since it was first applied clinically in 1939 [*58–60*].

The effect of venous stasis on the coronary system was investigated by Beck and Mako [*31*] in 1941. They concluded that the beneficial effect did not justify clinical application. However, by 1954, Beck [*30*] had employed the principle of reversal of venous flow in revising the Beck I operation. This procedure consists of partial coronary sinus occlusion, production of a sterile pericarditis and grafting of mediastinal fat to the pericardium, and was designed to provide an equal distribution of the collateral blood supply to the heart [*25,26*]. The Beck I technic has been subjected to extensive clinical use. Ninety per cent of patients have been reported to receive complete or almost complete relief and have been able to return to work. Since 1955, the operative mortality rate has been reduced from 8 per cent to 1.2 per cent [*25,26,29,92,133*]. In a recent series of seventy-one patients, Mozen [*108*] reported unsatisfactory results in less than 2 per cent.

Arteriolization of the Reversed Coronary Circulation. In 1943 Roberts et al. [*125*] demonstrated that the heart could be revascularized by anastomosing a systemic artery to the coronary sinus. A small glass cannula was used to connect the coronary sinus to various regional arteries (subclavian, innominate and brachiocephalic).

Arteriolization of the coronary sinus was first used in patients by Beck in 1948. Arterial homografts originally used were replaced by vein grafts which proved to be more suitable for the coronary sinus-aortic anastomosis [*22,23*]. Problems were encountered when the technic of arteriolization was combined with occlusion of the coronary sinus. Partial occlusion before or at the time of arteriolization was unsatisfactory and total occlusion was not tolerated [*104*]. To obviate this difficulty, Beck et al. [*27*] designed the two-stage Beck II operation which consists of partial occlusion of the coronary sinus two or three weeks following the arteriolization procedure.

Beck [*24,25,28*] considers the Beck II technic the more effective method of delivering blood to the myocardium. However, the Beck I procedure is used more frequently because the Beck II procedure is technically more tedious and requires two procedures.

In an experimental evaluation of the Beck II operation, Bakst, Bailey and their associates [*6–8,10,11,100*] demonstrated a persistent permanent increase in the retrograde coronary arterial flow even after the vein graft ceased to function in six to twelve months. This conclusion was corroborated by Eckstein and Leighninger [*54*] who found that the heart was stimulated to form a tremendous increase in intercoronary collaterals prior to occlusion of the vein graft which occurred approximately five weeks following arteriolization.

INDIRECT SURGICAL TECHNICS OF TREATING CORONARY ARTERY DISEASE

Operations on the Sympathetic Nervous System. The first surgical approach to the treatment of coronary artery disease was through the sympathetic nervous system. The original

TABLE II
TECHNICS OF NEUROSURGICAL INTERVENTION FOR THE RELIEF OF PAIN IN ANGINA PECTORIS

I.	Sympathectomy (ganglionectomy)
	A. Cervical ganglionectomy
	B. Superior cervical ganglionectomy
	C. Stellate ganglionectomy
	D. Cervicothoracic ganglionectomy
II.	Division of preaortic cardiac plexus
	A. Superficial resection of preaortic cardiac plexus
	B. Segmental pericoronary neurectomy
III.	Posterior rhizotomy
	A. Transection of posterior roots of the upper thoracic spinal nerves

investigators were of the opinion that operations upon the sympathetic nerve supply of the heart would actually increase the vascular flow to the heart. It is now generally conceded that division of the sensory nerve fibers of the heart results only in relief of the pain of angina pectoris. However, no review of the technics of myocardial revascularization would be complete without recognition of the neurosurgical approach which produced an overwhelming impact in stimulating research and advancement in this field. (Table II.)

Sympathectomy (Ganglionectomy). In 1899, Francois-Franck [*62*], a professor of physiology in Paris, suggested that sympathectomy be performed to relieve the pains of angina pectoris. The first cervicothoracic sympathectomy for treatment of angina was performed by Jonnesco [*83*] in 1916. The patient received symptomatic relief, even though a review of the history suggested that the actual diagnosis was syphilitic aortitis.

The radical operation of Jonnesco [*83*] was modified by Danielopolu [*48,49*] and Langley [*91*] who emphasized that only the sensory sympathetics should be resected with preservation of the motor sympathetic pathways. Fontaine [*61*] supported this conclusion in a review of 100 patients treated with this method. Later, Leriche and Fontaine [*93*] described a technic of cervicothoracic sympathectomy in which the stellate ganglion was preserved. In 1923, Coffey and Brown [*40,42*] reported a series of thirteen patients in whom resection of the superior cervical ganglion or merely division of the main cardiac branch from this ganglion produced relief from the symptoms of angina.

In 1927 Cutler [*44*] observed inconsistent results from all of these technics and emphasized that these operations offered only symptomatic relief. Other investigators [*43,94,117,131, 160*] attempted to demonstrate that sympathectomy would actively protect the heart. Cox and Robertson [*43*] noted that the mortality rate was reduced by 40 per cent and the size of the infarct decreased in animals whose stellate ganglion was resected prior to experimental coronary occlusion. Data published by Leriche, Hermann and Fontaine [*94*] corroborated these findings. The studies of Schauer and his group [*131*] revealed that stellate ganglionectomy decreased the incidence of ventricular fibrillation and mortality rate resulting from experimental coronary ligation.

In 1937, Ochsner and DeBakey [*117*] published a review on this subject in which they concluded that sympathectomy did afford the heart a degree of protection through its effect on the coronary circulation. In 1941 Yodice [*160*] observed that experimental cervicothoracic sympathectomy provided an additional protection against coronary occlusion for a transitory period of several weeks but the degree of protection was not thought sufficient to warrant clinical use of this technic. At the present time, however, this method is utilized almost exclusively for the treatment of intractable angina pain. Lindgren and Olivecrona [*97,98*] and White [*155,156*] have employed cervicothoracic sympathectomy extensively for this purpose with considerable success in relieving the symptoms of cardiac pain. White [*155*] states that resection of the first four thoracic ganglia will consistently interrupt all anatomic pathways associated with cardiac pain.

Resection of the Preaortic Cardiac Plexus. Fauteux [*56–60*] attempted to disrupt the sympathetic sensory fibers of the preaortic cardiac plexus by a direct approach in which a segmental sympathectomy of the coronary artery was performed. Pericoronary neurectomy, in which the nerve supply is stripped from the wall of the vessel, has proved capable of relieving pain and usually is combined with ligation of the great cardiac vein. Arnulf [*3,4*] was successful in alleviating angina symptoms by dividing the superficial portion of the preaortic plexus. White [*155*] presents three major criticisms of these methods. Both technics necessitate the added risk of an open thoracotomy; division of the vagal fibers which are intertwined with the sensory fibers in the preaortic plexus cannot be avoided, and the nerve fibers in the preaortic plexus may regenerate.

Resection of the Posterior Roots. White [*155*] considers posterior rhizotomy or transection of the posterior roots of the upper four thoracic spinal nerves to be the operation of choice for the relief of cardiac pain because it carried the lowest mortality rate, and there is no postoperative pain after division of the posterior sensory roots.

Total Thyroid Ablation. Most technics of surgically treating coronary artery disease have been designed to increase the myocardial vascularity. In the early twentieth century Kocher [*88*] observed that relief of cardiac insufficiency occurred in a patient following total thyroidectomy. Hamilton [*77*] noticed that congestive heart failure in patients with hyperthyroid was favorably affected by subtotal thyroidectomy. In 1925 Boas and Shapiro [*39*] performed subtotal thyroidectomies in a series of patients in an attempt to alleviate cardiac symptoms, with unsatisfactory results. The technic of total thyroid ablation as a means of relieving the symptoms of angina pectoris and congestive failure was originally suggested by Blumgart, Levine and Berlin [*38*] in 1933 in an effort to decrease the metabolic requirements of the heart and allow it to function more efficiently in the presence of its reduced vascular supply. In 1936, Blumgart [*157*] analyzed a series of ninety-five patients with angina of whom 47 per cent received excellent results following total thyroidectomy. Cutler and Schnitker [*46*] reported a series of twenty-seven patients with severe angina of whom 47.6 per cent received greater than 90 per cent improvement, and only 9.5 per cent were improved less than 50 per cent. In 1941, Cutler and Hoerr [*45*] reported the results of a five-year follow-up study on patients treated with this method and concluded that this technic was warranted in a select group with intractable angina but was not satisfactory in patients with associated congestive failure or cardiomegaly. By 1944, this operation had been largely abandoned because the beneficial results were not considered sufficient to justify the hazards of a significant mortality rate and there was a high incidence of tetany and recurrent laryngeal nerve injury and establishment of severe myxedema [*117,157*].

Ligation of the Internal Mammary Artery. Bilateral ligation of the internal mammary arteries as a method of treating coronary artery disease was conceived by Fieschi, an Italian internist, and cited by Battezatti et al. [*15*] as originally performed by Zoja and Bianchi in 1939 [*15*]. The technic was designed to increase the blood supply to the heart by utilizing previously recognized channels which communicate between the internal mammary arteries and the coronary system [*74,82, 90,107,126,153,159*]. Proponents [*14,52,66,67*] of this technic maintain that hypertension develops proximal to the site of occlusion of the internal mammary artery which, in turn, causes distention of the pre-existing collaterals between the internal mammary arteries and the coronary system and results in an increase in the volume of blood flow to the myocardium. Interest in this technic was revived by Battezzati, Tagliaferro and De Marchi [*15,52,53*] in 1955 when they reported rapid disappearance of angina pain in a series of forty-one patients treated with this method. In more than 100 patients, Glover [*66,67,86*] reported clinical improvement in 68 per cent following this treatment with no demonstrable change in only 11 per cent.

In experimental studies, Glover [*66,67*] observed an immediate sustained rise in pressure of 14 mm. Hg in the occluded internal mammary artery. In these studies, coronary ligation resulted in a 42 per cent mortality rate in animals in which bilateral occlusion of the internal mammary artery was present as compared with a control mortality rate of 93 per cent. Employing a plastic reproduction of the internal mammary-pericardiophrenic artery system, Taber and Marchioro [*136*] reported an increase in the pericardiophrenic artery flow and pressure following occlusion of the internal mammary artery. Vansant and Muller [*142*] were unable to demonstrate any increase in pressure in the occluded internal mammary artery or its tributaries nor was there evidence of significant protection against subsequent coronary occlusion following ligation of the internal mammary artery. Other investigators, Blair et al. [*36*], Adams [*2*], Griffin et al. [*72*], Lord et al. [*99*] and Sabiston et al. [*128*], have failed to demonstrate that this technic significantly increases the collateral flow to the heart.

DIRECT SURGICAL APPROACH TO CORONARY ARTERY DISEASE

Endarterectomy or Intimectomy. The development of the cardiopulmonary bypass appa-

TABLE III
CLINICALLY APPLIED TECHNICS OF MYOCARDIAL REVASCULARIZATION

1. Cardiopericardiopexy [139]
2. Cardiomyopexy [19]
3. Cardio-omentopexy [119]
4. Cardiopneumopexy [41]
5. Myocardial implantation of the internal mammary artery [151]
6. Myocardial implantation of graft from thoracic aorta [135]
7. Occlusion of great cardiac vein with segmental coronary neurectomy [59]
8. Beck I technic [25]
9. Beck II technic [25]
10. Total thyroid ablation [157]
11. Bilateral internal mammary artery ligation [66]
12. Coronary endarterectomy [5]

TABLE IV
COMPARISON OF MOST FREQUENTLY APPLIED TECHNICS OF MYOCARDIAL REVASCULARIZATION

Technic	Improvement of 50 Per cent or More	Operative Mortality
Cardiopericardiopexy (Thompson [139])	90%	7.0%
Myocardial implantation of mammary artery (Vineberg [151])	79%	5.6%
Beck I technic (Beck [29])	90%	−8.0%

ratus has stimulated interest in a direct surgical attack to relieve obstructions of the coronary arteries. In 1954, Pratt [122] suggested the clinical application of coronary thrombectomy. The feasibility of performing an endarterectomy on the coronary arteries was demonstrated in cadavers by Absolon and his associates [1] in 1956. May [102] successfully performed coronary intimectomies on animals without death or disability. Since 1957 Bailey [5] and May [103] have reported six patients upon whom coronary endarterectomy was successfully performed.

Substitution of a Graft for the Obstructed Segment. In 1952, Murray [109,111,113] suggested the use of a technic on the coronary arteries which he had previously described to restore the continuity of larger arterial vessels by resection of the occluded segment and replacement with a venous homologous graft. Murray [112] described a method by which the distal segment of the involved coronary could be perfused with oxygenated blood while the graft was sutured into place. Three of thirteen animals survived without infarction by perfusing the distal segment through a tube inserted into the internal mammary artery.

Direct Anastomosis of Other Vessels to the Coronary Arteries. Murray [112,114] and his associates demonstrated that perfusion of system blood into the distal segment of a divided coronary artery would prevent formation of a myocardial infarction. Direct anastomoses were performed between the coronary arteries and the internal mammary artery, or other branches of the aorta. Eight of seventeen dogs survived internal mammary-coronary artery anastomosis and did well postoperatively. This technic has not been applied clinically.

An Ivalon® prosthesis was employed by Absolon and his group [1] to deliver blood from the subclavian artery to the coronary artery. Use of this technic or direct anastomosis to the internal mammary or carotid artery was performed in experimental animals with a reasonable survival rate. Julian [84] produced side-to-end anastomoses between the ascending aorta and the coronary vessel using homologous arterial grafts with induced asystole and total cardiac bypass. Two of seven animals survived. Difficulty was encountered in restoring sinus rhythm. Studies by Bailey et al. [6], using a segment of jugular vein as a graft between the aorta and the coronary artery, were not successful.

Methods of continuously perfusing the distal segment of the coronary artery while performing the anastomosis to the systemic vessel were developed by Thal and his group [137] and Moore and Riberi [106]. The vessels were sutured over a catheter passed directly through the site of the anastomosis. In a series of twenty consecutive internal mammary-to-coronary anastomoses, all animals survived for twenty-four hours, but more than 50 per cent died within three weeks. The anastomosis was found to be patent in twelve of eighteen animals.

Resection of Infarcted Myocardium. In 1947, Murray [110] published the results of a study in which the area of myocardial infarction was excised and the defect in the ventricular wall closed. Acute experiments indicated that this procedure would significantly reduce the mortality rate from myocardial infarction. Murray [110,112,113] has suggested that this operation might be applied clinically.

SUMMARY AND CONCLUSIONS

A review of the surgical technics of treating coronary artery disease has been presented. The operative technics have been described and the rationale for the individual procedures discussed. Experimental evidence of the effectiveness of the various methods was considered.

Twelve technics of myocardial revascularization have been performed clinically. (Table III.) Of these methods, only three have been subjected to long-term application and their results have been comparable especially when performed by the physicians who designed them (Table IV); however, none of these procedures has been accepted for wide general use. A fourth technic, that of bilateral ligation of the internal mammary artery, has recently received an extensive clinical trial even though the physiologic basis for the operation remains doubtful. The remaining operations have either been abandoned or must be considered in the early phase of experimentation.

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Siliconizing Intestinal Decompression Tubes

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SILICONES are relatively inert polymeric substances whose basic structure is a chain of a succession of silicon and oxygen atoms (Si–O–Si–O) rather than the carbon chain (C–C–C). These polymers may be prepared in liquid, resin, or rubber form. One or more organic radicals are attached to each silicon atom thus producing an organosilicon with a wide variety of uses. Since the organosilicones are physiologically inert, the only value such compounds have is due to their physical properties: (1) they have low surface tension permitting the silicone fluids to spread easily; (2) they are repellent to water or liquids; (3) they will not support bacterial growth; and (4) they have abhesive properties.

Chemically the silicone materials have been proved to be non-toxic or of a low order of toxicity. Application to the skin or injection of the fluid into the tissues causes no inflammatory reaction. Glass tubing and bottles treated with silicone have been and are at present extensively used for transfusions of fresh whole blood. After a careful review of the available literature, McGregor [1] reported that all studies to date [2–7] have given no indication that silicone oils or preparations will cause toxicity of any type.

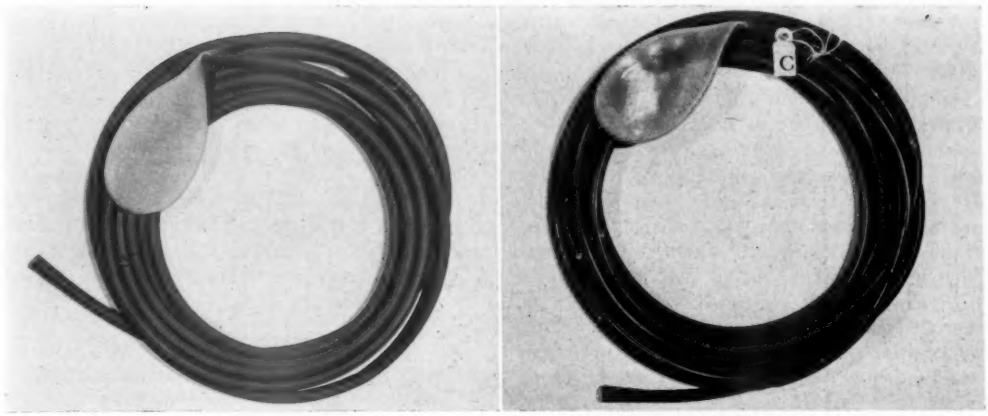
In addition to an absence of toxicity, the silicones have never shown allergenic properties irrespective of the method of administration. Silicones have been rubbed into the skin, ingested and injected without producing any allergic reaction.

The physical property which suggested the use of silicones as a coating applied to intestinal decompression tubes is its abhesive power. This permits tubes treated with silicone to repel water, blood, mucus and most organic materials. Practically no material will stick to the silicones, nor do they support bacterial growth. Because of this abhesive property, decompression tubes treated with silicones should be much more comfortable for the patient since the nasopharyngeal mucus will not adhere to them.

Early in 1959, Yonehiro reported to McGregor of Dow Corning Research Center that Wangensteen had been using Silastic tubing for nasogastric suction in patients requiring intestinal decompression. This Silastic tube contains no conventional rubber. It is an elastomeric compound comprising a silicone polymer and a filler which is chemically bound to the polymer.

Yonehiro reported being impressed by the comfort given to the patients using such Silastic tubes as compared with the ordinary rubber intestinal decompression tubes. However, the transparency of the Silastic tube to x-ray film and its softness were real problems interfering with proper intubation. In addition, silicone rubber is highly permeable to oxygen and carbon dioxide which permits intestinal gases to readily diffuse into them. Wangensteen suggested to Dow Corning that the tip be made radiopaque and the tubes be made stiffer for use as intestinal decompression tubes.

With this evidence, we decided to coat the intestinal decompression (Cantor) tubes with silicone. The silicone was applied to the inner and outer walls of the tubes as a liquid supplied by the Clay-Adams Company under the name of "Siliclad." At the June meeting of the Grace



1A 1B

FIG. 1. A, Cantor tube untreated with silicone. Note absence of reflection as compared with the treated tube. This surface is much rougher than that of the silicone-treated tube. B, Cantor tube treated with silicone (C). Note the definite reflection indicating the presence of a coating. This surface was much smoother and far less irritating to the mucous membrane than the untreated tube.

Hospital staff, an experimental study involving the use of these silicone treated tubes was reported.

METHOD

Twelve patients with intestinal obstruction were used in this experimental study. These were divided into four groups of three patients each. In the first group (tube U), untreated Cantor tubes were used. In the second group (A), the Cantor tube was treated with a light layer of silicone. (Fig. 1A.) In the third group (B), the Cantor tube was treated with a heavier concentration of silicone, and in the fourth group (C), a fairly heavy coating of silicone was applied. (Fig. 1B.)

The tests were performed from two points of view. First, we were interested to determine whether there was any difference in the reaction of the patient to each specific tube. In other words, were the patients more or less comfortable with each specific tube. Since the tubes were all the same size and the same kind of rubber, any differences would of necessity be due to the effect of the different concentrations of silicone upon its surface. The effect of the different tubes upon the nasopharyngeal mucosa would be reflected in an outpouring of mucus. The most uncomfortable tubes would be the ones which caused the most mucus to be formed by the patient whereas the most comfortable tube would be the one causing the least amount of mucus to form and to adhere to the tube.

The second point of view was to determine whether the mucus adhered to the tubes in different ways and what differences there were, if any, in the ease with which the tubes could be cleaned when they were returned to central supply.

RESULTS

1. All the silicone-treated tubes were much better tolerated by the patient than were the untreated tubes. Much less mucus was poured out by the patients whose tubes were treated with silicone than by those patients, used as controls, whose tubes were not treated with silicone. One patient, used as a control, whose tube was not treated with silicone complained so much that the untreated tube was removed and tube A was inserted. When asked whether she noted any difference, she replied that tube A was much more comfortable. When this tube was removed on the fifth day, considerably less mucus was found on it than on the untreated tube previously removed.

2. A comparison of tubes A, B and C resulted in the observation that tubes B and C were much better tolerated by the patient than was tube A or the untreated tubes. Less mucus was found on tubes B and C than was

the case with A. In addition, the mucus was much easier to remove on tubes B and C.

3. When the tubes were returned to central supply, it was found that tube C was by far the best tube insofar as the adherence of mucus was concerned and the ease with which this mucus could be removed. Tube B was almost as good and tube A was a poor third. The untreated tubes were found to have considerable tenacious mucus which was removed with much more difficulty than was the case with the silicone treated tubes. Tube C was found to lose its stickiness after one use but the rubber remained soft and smooth and highly resilient. Our central supply was greatly impressed with tubes B and C considering them as improvement in the intestinal decompression tube.

CONCLUSIONS

It appears that the application of silicone to the rubber tube renders its surface smoother and much less irritating to the nasal mucosa. As a result, much less mucus is poured out by the patient. Because of this, patients in whom the silicone treated tubes were used were found to be far more comfortable. Upon the return of the treated tubes to central supply, a silicone-treated tube was found to be much easier to clean and hence permitted an appreciable saving in time to the girls in this department. This should reflect itself in a saving to the hospital in that more time is left for other work.

The silicone-treated intestinal decompression rubber tubes have the following advantages over the Silastic tubes: (1) they are resilient and elastic inhibiting knot formation such as may occur with softer tubes, (2) they are radiopaque and hence easily localized as compared with the transparent Silastic tube, (3) they are much less permeable to intestinal gases, (4) the silicone-treated surface will not support bacterial growth.

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A Clip for Temporary Occlusion of Cerebral Arteries

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PREVENTION of rupture of an intracranial aneurysm during its repair or control of hemorrhage upon rupture is in our opinion best accomplished by producing local hypotension in the aneurysm. Whether or not hypothermia is employed, this hypotension is produced by temporary occlusion of the primary feeding artery or arteries. The method is especially useful in dealing with anterior communicating or middle cerebral arterial aneurysms.

Occlusion of the parent artery by traction, using a thread or rubber band, is considered dangerous because, in a confined operating space, it gives inadequate control of an easily injured vessel. The artery is usually occluded by the application of a clip. Most clips and their applicators, large and unwieldy, crowd valuable operating space and are difficult to apply or remove rapidly and safely.

Positive-action clips are poorly controlled, as it is impossible for the operator to determine how much closing pressure he has applied in occluding the vessel. This increases the possibility of damage to the artery. The ordinary negative-action clips close too forcibly and for the previously mentioned reasons are not completely desirable.

We have designed a negative-action clip* (Fig. 1) which seems to overcome the objections mentioned. The clip is made of beryllium-copper, and its occluding surfaces are preferably smooth but may, if desired, be serrated or perforated for more effective vessel-grasping power. For the anterior and middle cerebral arteries, the over-all length of the clip is 12 mm. and the width is 2.5 mm. on its closing surfaces. (A larger one is used for the carotid artery and closure of aneurysms with wide necks.) Two flared wings (2 by 2.5 mm.) are fashioned at the proximal end of the clip for application and removal with a "long fingers" tissue forceps. (Fig. 2.) This forceps has deep serrations measuring 3 mm. in width which grasp the wings firmly to prevent the clip from being dislodged as it is opened to a greater angle. If desired, a bayonet type forceps is equally satisfactory for the smaller clip. Excessive flexibility of the ordinary bayonet, if present, can be eliminated by placing a suitable resistant spring on the shaft of the forceps to permit full opening of the clip. Figure 3 shows the clip when applied. A serrated dressing forceps which grasps the clip

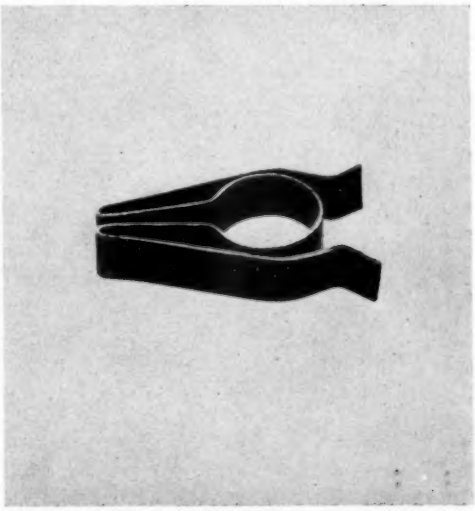

FIG. 1. Clip.

*Obtainable from Hastings Laboratories, Bass River, Massachusetts.

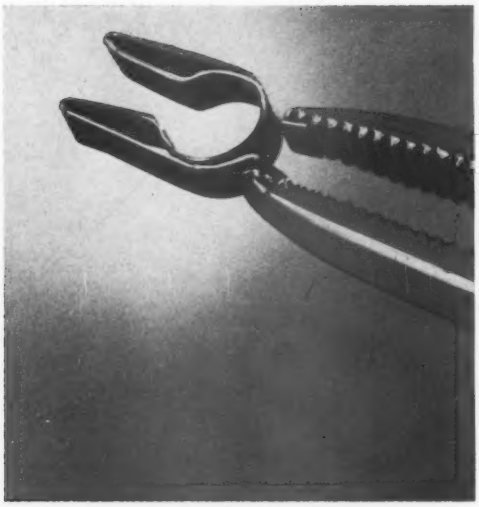

FIG. 2. Clip opened by applicator.

FIG. 3. Clip in closed position on artery (simulated by rubber tubing).

firmly and locks upon closure, holding the clip fully opened until released, can be used to advantage.

The clip is calibrated so that the closing pressure of the blades is between 80 and 90 mm. Hg. (The closing pressure for the carotid artery is between 130 and 150 mm. Hg.)

The clip is used principally for temporary arterial occlusion and should not be left permanently in the intracranial cavity because of the possible toxic effects of beryllium. For this purpose, the manufacturer is working with other metals, but as yet none are satisfactory.

SUMMARY

A beryllium-copper, temporary, self-occluding arterial clip is described.

Acknowledgment: I am grateful to Mr. John Hastings, Hastings Laboratories, Bass River, Massachusetts, for his help in developing the instrument.

A Self-Retaining Spermatic Cord Retractor

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DURING the active practice of surgery I occasionally observed certain complications following inguinal herniotomy which are well known to surgeons, that is, deep distress in the inguinal canal area with or without swelling of the cord and testicle. The cause of this was usually ascribed to retracting trauma of the cord or to abnormally constricting sutures. The former undoubtedly occurs more frequently than is generally thought; the use of tape around the cord and the inadvertent severe retraction on the part of an inexperienced assistant are quite likely to be the responsible factors.

The accompanying illustration is self-explanatory. (Fig. 1.) The weighted handle acts as a retainer while the smooth loop at the other end holds the cord quite steadily, thus protecting the veins from trauma. The instrument was made for me by Sharp and Smith in 1931.

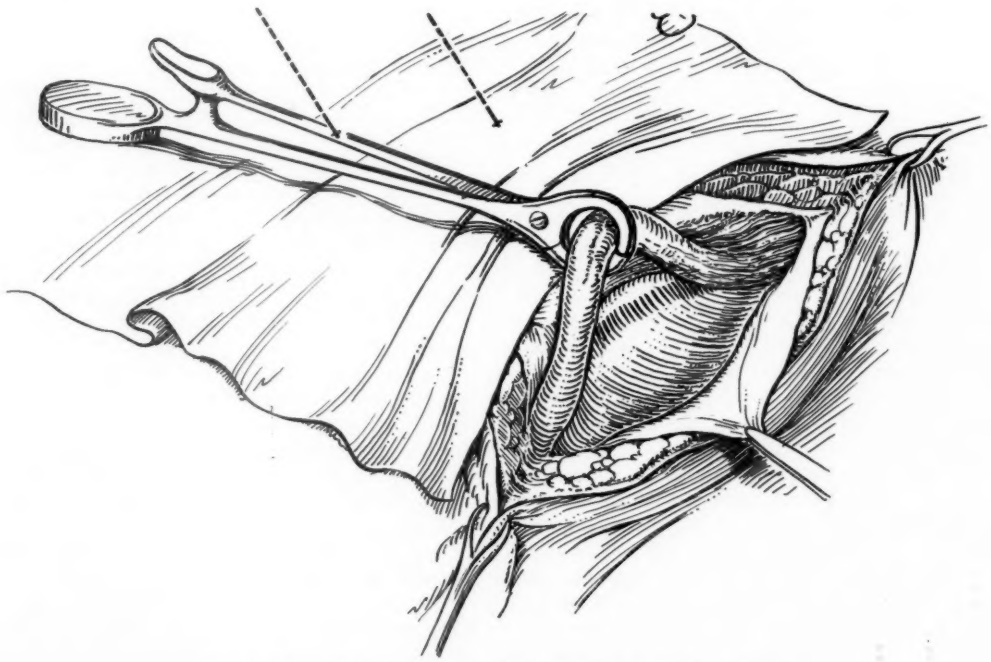

FIG. 1. The self-retaining spermatic cord retractor is shown in use.

A New Transparent Plastic Surgical Drape

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THE problem of infection in the postoperative patient is becoming more and more acute. Every infection committee member knows that there is no one source for all of the postoperative infectious complications. The over-all situation embodies problems associated with the hospital ward, operating suite, skin of the patient, pathogenic flora of the operating room personnel, surgical truma and postoperative course. Direct attack has been made on all phases of this problem except the skin of the surgical patient. A solution to this phase may be in isolating the skin from the operative wound.

The skin remains the one unsterile factor in every procedure. The multiplication of bacteria on any skin surface over a period of time has been calculated. Despite the method of skin preparation, the best cleansing procedures can at most give only a surgically clean field surrounding the surgical wound. None of the present germicides or detergents can fully prevent the multiplication of residual or undestroyed bacteria.

Most draping methods have remained unchanged over the past hundred years. Attempts have sometimes been made to seal out the skin edges by suturing stockinette or drapes directly to the wound. These have had the disadvantage of textile capillarity which tends to bring bacteria into the wound. At the same time, no part of the operative field outside of the incision is visible to the operator during the procedure. The problem of contamination by capillarity was unintentionally solved for a time during the last war. Rubberized silk was often autoclaved and used for substitute draping material in an emergency. A single layer of this material was satisfactory for emergency surgical procedures, but its inherent difficulties made it unsatisfactory for anything more. Despite its waterproof feature, the drape was heavy, hot and perishable with repeated autoclaving.

During the past several years, new plastic materials have become available. Although these synthetics are being used with increasing frequency in all types of prosthetics and in suture material, many surgeons have been reluctant to use plastics as surgical drapes. This hesitancy is due partly to fear of the electrostatic properties of some plastics near volatile anesthetic gasses, and partly to unfamiliarity with this new type of material as a surgical drape.

About two years ago, a new plastic surgical drape (Vi-DRAPE Surgical Film*) was made available. This plastic film is thin, transparent, waterproof and tough. At the same time, it is a complete bacterial barrier. The drape is completely safe when used correctly, with properly grounded equipment. It is made to adhere to the skin by use of a spray-on adhesive (Vi-HESIVE Adherant*). Instead of a skin surface which is merely surgically clean, it provides a surface which is completely sterile. The incision is made directly through the drape, and the plastic remains tightly adherent to the skin surface until the closure of the fascia and the subcutaneous fat. At that time, the skin can be sutured after peeling the plastic drape back from the skin edges.

The advantages of this new plastic drape are its flexibility, complete sterility and transparency. This latter feature allows the observation of the entire operative field, including such things as a nearby colostomy or ileostomy. The adequacy of the blood supply to that particular area may be watched during the entire procedure. At the same time, the operative field remains completely sealed off and sterile.

More than two years ago, a complete transition to this plastic drape was effected in the operating rooms of the Ohio State University

* Manufactured by the Aeroplast Corporation.

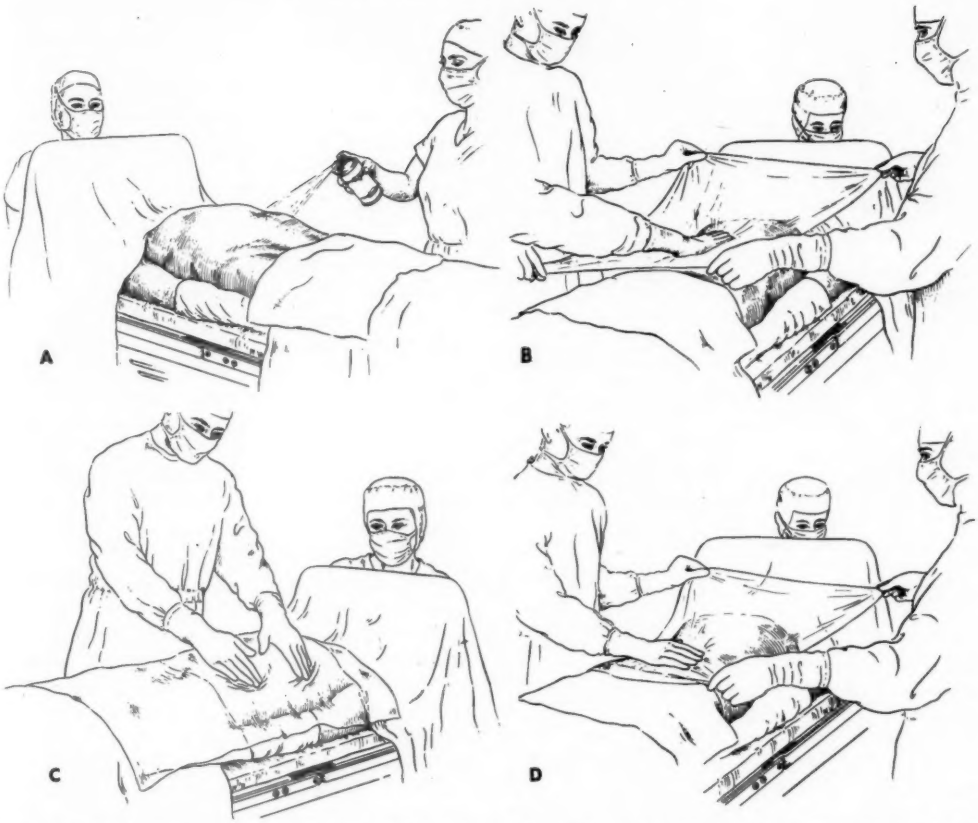

FIG. 1. A, this demonstrates the application of the spray-on adhesive from the spray container. The container is held 12 inches from the surface of the skin. B, the drape is pressed to the point of the proposed incision. C, the drape is spread out in all directions from the point of pressure. D, this shows the drape being fixed by the operator. He may fix his side of the drape to the tacky surface first, and then spread the drape out in all directions.

Health Center. In a preliminary evaluation of the material, cultures were taken from the skin beneath the drape at the completion of the operation in the first fifty cases. In only two of these was there any growth at all. A coagulase-negative staphylococcus albus in very light growth was identified. Others have demonstrated uniformly positive skin cultures when using standard draping technics.

It has been the impression at this institution, after extensive trial in general surgery and in all of the subspecialties of that department, that the drape is a very useful adjunct. There have been no unfavorable reactions to the use of the plastic material. Several patients who complained of local irritation were subsequently given patch-tests with the plastic and the spray-on adhesive, but no instances of sensitivity to the material have been noted.

In applying the drape, the patient's skin is first prepared in the conventional manner, using a detergent or antiseptic of choice. Following the usual meticulous mechanical and germicidal cleansing, the skin is dried. The spray-on adhesive is then applied by the circulating nurse from the spray container, holding it 12 inches from the skin surface. (Fig. 1A.) The spray-on adhesive is tinted pink, so that the evenness of application can be determined by its uniform color on the skin surface. Application of adhesive which is too thin or too thick will cause the plastic drape to come loose from the skin, or to slip over the surface of the skin without sticking. With a little practice,

FIG. 2. This demonstrates the incision being made directly through the plastic drape and skin. A large laparotomy sheet is used to cover the plastic drape.

the circulating nurse can readily learn correct application. After the spray-on adhesive has been applied, it is allowed to dry until tacky (twenty to forty seconds). The plastic drape is then held taut over the operative field by the surgeon and his assistant and lowered onto the skin. To avoid trapping air bubbles beneath the drape, a third person (normally the scrub nurse) first presses the drape to the point of the proposed incision. (Fig. 1B.) The drape is then spread out in all directions from that point. (Fig. 1C.) If a third person is not available, the operator may fix his side of the drape to the tacky surface first, and then spread the drape out in all directions. (Fig. 1D.)

The drape is large enough to cover the entire area of the prepared skin and to overlap above, below and at the sides. Thus, a completely sterile, bacterial and water impervious covering extends from the chin to the knees of the patient, and from one side of the opertaing table to the other. This covering is both sterile and transparent. Visualization or even palpation of remote areas remains possible without contamination of the operator. This is particularly useful when stab wounds are to be made for drainage through a lateral aspect of the field, or when it is necessary to palpate the scrotum, as may be necessary in a herniorrhaphy.

A large laparotomy sheet is used to cover the plastic drape, and the incision is made directly through the plastic and the skin (Fig. 2), which remain sealed together until completion of the procedure. The plastic drape seals off the whole area beneath the large laparotomy sheet, so that there can be no field contamination by capillarity through a soaked sheet.

EXAMPLES OF DRAPING TECHNICS

A possible disadvantage of the drape is that it may obscure skin folds. This can be overcome by marking out the skin incision before the spray-on adhesive and drape are applied. This technic may be particularly useful in thyroidectomy, when the incision may be marked out with a taut suture prior to application of the drape.

It is well known that many plastics constitute an explosive hazard in the operating room, but this particular plastic film has been thoroughly studied [*1*] and found to present no hazard when used under the proper grounding technics [*2*].

There is no panacea for the problem of surgical infections, but the use of this plastic drape does appear to offer the possibility of eliminating wound contamination from the surrounding skin edges.

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CASE REPORTS

Cavernous Hemangioma of Striated Muscle

REVIEW OF THE LITERATURE AND REPORT OF ONE CASE

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CAVERNOUS hemangiomas of striated muscle are fascinating tumors. Since only some 386 cases of this entity have been reported in the world literature, it is doubtful that many surgeons have seen a case or would chance to diagnose it correctly. Jones [5] states that Liston (1843) recorded the first case of hemangioma of muscle. The latter was an erectile tumor of the popliteal space. Excellent and comprehensive reviews of this subject have been made by Davis and Kitlowski in 1930 [1], Jenkins and Delaney in 1932 [2], Shallow, Eger and Wagner in 1944 [3], Bonvallet in 1950 [4], and Jones in 1953 [5]. Bendeck and Lichtenberg [6] (1957) recently reviewed the literature and added two cases bringing the composite total to 386.

The object of this paper is to record another case with review of the literature since the paper of Bendeck and Lichtenberg [6]. Since the latter paper, twelve new cases have been reported and are summarized in Table 1.

CASE REPORT

J. B., a twenty-six year old white, married, construction worker, was admitted to Our Lady of Lourdes Hospital in Binghamton, New York, on December 2, 1957. Eight months previously he had noted a pain in his back. The pain was intermittent and aching in character. He had recently had the impression that a swelling was present. The patient consulted with his physician who at first glance thought that the tumor represented a lipoma. On a more thorough and careful examination, the swelling seemed to pulsate and auscultation revealed a systolic bruit.

On physical examination, the patient was very well developed and well nourished with a blood

TABLE 1
RECENTLY REPORTED CASES OF CAVERNOUS HEMANGIOMA OF SKELETAL MUSCLE AND COMPOSITE TOTAL

Author	Location of Tumor	No. of Cases
Bendeck and Lichtenberg [6] (previously reported cases)		386
Prignacchi [7] (not included by Bendeck and Lichtenberg)	Semimembranosus left	1
Chironi [8]	Brachialis	1
Scott [9]	Scalenus posticus Mylohyoid	2
Parrini [10]	Rectus femoris Soleus and gastrocnemius Muscles under tendon Achilles Quadriceps Vastus medialis	5
Mercadente [11]	Pectoralis major	1
Zampi [12]	Muscles of mid-thigh along the course of the saphenous nerve	1
Giugiano and Bertola [13]	Abductor hallucis Flexor digitorum brevis	1
Present case	Levator scapulae with contiguous four muscles	1
Total		399

Note: Tumors involving mainly one muscle with spread to another or more were counted as one case.

FIG. 1. The circular marking describes the maximal area of swelling.

pressure of 110/70 mm. Hg, and a pulse of 84. The positive physical findings were limited to his left upper back. Medial to the superior angle of the left scapula, a swelling was present. (Fig. 1.) The swelling, although rather noticeable, was not discreet nor were its boundaries sharply defined. Pressure upon it resulted in a visible and tactile pulsation. It was compressible. Auscultation revealed a grade 2 systolic bruit. The skin over the area was normal in consistency and color and not unusually warm. One had the impression that it lay certainly below the subcutaneous layer and perhaps deeper.

A posteroanterior roentgenogram of the chest showed an obvious soft tissue swelling in the left supraclavicular area. Angiocardiogram revealed at least two prominent arterial feeders entering the tumor from the left axillary artery. The vascular network within the mass was tortuous. Detailed studies of the left scapula revealed no bony erosion or destruction. Tentative diagnosis prior to surgery was hemangio-endothelioma or angiosarcoma.

On December 5, 1957, the patient was operated upon under endotracheal anesthesia. He was placed in the right lateral decubitus position. A generous incision was outlined following the contour of the scapula. Bleeding in the subcutaneous and the muscle layers was rather severe and necessitated meticulous hemostasis with fine cotton ligatures. The trapezius muscle was transected for the entire length of the incision. This provided a good exposure of the area of disease. The tumor involved mainly the levator scapulae, but, in addition, portions of the rhomboideus minor and major were involved as they inserted into the medial border of the scapula. A portion of the supraspinatus and some of the subscapularis as well as the attachment of the serratus magnus were involved. Since the nature of the tumor was not known, a wide margin of normal muscle was obtained in addition to transecting a greater portion of the superior angle of the scapula. Entering the tumor from above were at least two arteries the size of an average radial

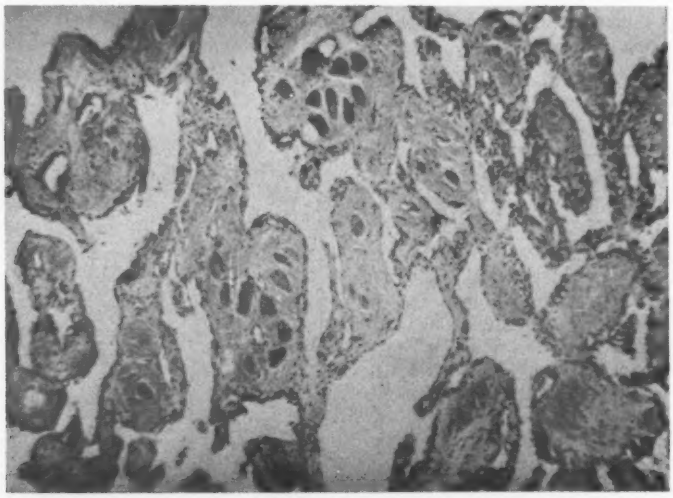

FIG. 2. The cavernous spaces supported by a fibroblastic stroma in which are interspersed islands of striated muscle are well demonstrated (high power).

artery. The tumor was rubbery and firm and seemed grossly infiltrative. Its color was a yellowish, reddish gray.

Closure was effected by uniting the sectioned supraspinatus muscle to the underlying subscapularis muscle and thus sealing the transected edge of scapula. The wound was irrigated with saline and penicillin solution. Cotton sutures were utilized to close and approximate the muscle layers and the subscapular space was drained by means of a Penrose drain.

The postoperative course was uncomplicated. There was a moderate amount of serosanguinous fluid drainage for the first two or three postoperative days as the drain was progressively shortened. Shoulder movement was excellent and has continued to be so. There has been no recurrence of the tumor.

Patbological Report. The specimen consisted of a partially encapsulated and fairly well circumscribed pale gray spongy mass with large pieces of skeletal muscle and a narrow, long piece of flat bone attached to its surface. The mass measured 18 cm. by 12 cm. by 10 cm. The growth was incorporated with the periosteum along the entire length of the bony piece attached to its surface.

Microscopic Report. Sections revealed a vascular tumor consisting of large and small blood sinuses and scattered foci of well formed capillaries. Some of the sinusoids were thrombosed. Most of the stroma was hyalinized. Fibroblastic proliferation between the sinusoids and islands of striated muscle was noted. (Fig. 2.)

COMMENT

Hemangiomas of striated muscle, according to most authors [*1–3,5,6*], are probably congenital in origin. Trauma may play a role as a contributing factor in their growth. A simple classification into capillary, cavernous, venous and arterial is a practical working scheme realizing that a mixing of this pattern is present in about 38 per cent of those reported. A strictly cavernous arrangement was present in 54 per cent while a purely capillary pattern was present in 3 per cent of the cases. Purely arterial and venous types accounted for 2 per cent each of the total cases reported.

Grossly the tumors may have a bluish hue or present a reddish, yellowish gray appearance. The tumors may be spongy, compressible, hard, or firm. On section, the vessels may stand out like stems. Thirteen per cent of these tumors were well circumscribed with a distinct capsule within a muscle. In 5 per cent of the reported cases, they were partially circumscribed having in part a distinct capsule while the remainder infiltrated the muscle. The largest number were of the diffuse type and these hemangiomas infiltrated in an irregular fashion into one or adjacent muscles and involved veins, arteries or nerves. The diffuse type accounted for 39 per cent of the cases. These tumors differ from the usual benign tumor in that growth is by infiltration and not by expansion.

Microscopically one sees cavernous, capillary, venous and arterial vascular elements in a connective tissue stroma. Rarely are there ossified areas. Calculi or phleboliths are present where there is stasis. Remnants of striated muscle are found in varying stages of degeneration.

Eighty-five per cent of the patients with hemangiomas of striated muscle are in the first three decades of life. These tumors are slightly more common in women. Pain is a cardinal symptom occurring in 60 per cent of the cases. A mass is almost always present and is found in 98 per cent of the tumors reported. Only 3 per cent of these tumors pulsate and a bruit is heard in 1.8 per cent. The overlying skin was normal in 39 per cent but can be bluish, warm, telangiectatic, ulcerated or contain nevi. Any striated muscle can be involved but the quadriceps is the most frequently involved muscle.

One muscle was involved in 66 per cent of the cases reported. Two muscles were involved in 12.5 per cent, three muscles in 3.6 per cent, four muscles in 1.2 per cent and five muscles in 0.3 per cent of the total number reported.

In the differential diagnosis, these possibilities have been entertained: lipoma, sarcoma, fibroma, hematoma, primary carcinoma, dermoid cysts, syphiloma, chronic myositis, tubercular myositis, myositis ossificans, hydatid cyst, and hernia of muscle or of lung. Treatment of course should be complete excision when this is feasible. Partial excision, amputation and the use of sclerosing agents have been utilized. Recovery and cure is the rule if complete excision is carried out.

This patient's first complaint was pain and the discovery of a mass. Initial diagnosis was a lipoma although further examination revealed pulsation and the presence of a bruit. Angiocardiogram was very successful in outlining the area of disease and revealing the vascular nature of the tumor. This tumor showed the more rare characteristics of hemangiomas of muscle. It pulsated, had a bruit and involved a total of five muscles by virtue of its infiltrative

qualities. A partial scapulectomy was necessary for its complete ablation.

SUMMARY

A case of hemangioma of striated muscle is reported bringing the total reported to 399. This tumor exhibited the more rare characteristics such as pulsation, bruit and multiple muscle involvement. Cure was effected by wide excision and partial scapulectomy.

A brief review of the pertinent data concerning these tumors is presented.

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Hemorrhage from a Solitary Jejunal Diverticulum

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THE small intestine is infrequently involved by diverticulosis. Edwards [4] found that when this portion of the alimentary canal does bear diverticula, they most frequently occur in the proximal jejunum. Prior to 1950, the surgical significance of these lesions was rarely discussed in the literature. In 1950, Kozall et al. [8], noted the presence of jejunal diverticula when operating upon a patient for massive gastrointestinal hemorrhage. Unaware that the grossly innocuous appearing diverticula were the source of hemorrhage, they did not resect the involved area and since no other lesion was apparent, the abdomen was closed. A second laparotomy was necessary when the patient continued to bleed. The involved jejunum was then resected and the bleeding ceased. Numerous diverticula containing ulcerations and freshly clotted blood were found in the specimen.

This case prompted the authors to survey the literature. They found some 300 cases of mesenteric diverticula of the small bowel of which only six had been complicated by hemorrhage. This report alerted the surgeon to the potential complications of this disease and since then, numerous reports have dealt with this problem [1,3,11–13]. However, despite the increase in the number of reports of jejunal diverticulosis, instances of massive hemorrhage associated with this lesion have remained few and in those reported, documentation of the causal relationship between diverticula and hemorrhage has often been lacking or incomplete.

Recently, we treated a patient with massive gastrointestinal hemorrhage from an ulcerated solitary jejunal diverticulum. The case, we believe is of interest, first because it adds to the documented evidence that an innocuous appearing and easily overlooked lesion may be the source of massive hemorrhage and second, because of certain specific problems encountered in the pre- and postoperative care.

CASE REPORT

S. L., a sixty-one year old white man, was admitted to the Veterans Administration Hospital, Buffalo, New York, on March 26, 1959, with the complaint of bleeding from the rectum of two days' duration. A few hours prior to admission, bleeding had increased and the patient felt weak and faint. There was no hematemesis. The past history was not significant.

On admission, the patient was in profound shock. There was bright red rectal bleeding. The blood pressure was 40/0 mm. Hg and his pulse was 100 per minute and thready. The remainder of the physical examination was negative.

A cutdown was performed. The patient was transfused with type O Rh negative blood and oxygen was given by nasal catheter. Laboratory studies revealed a hemoglobin of 10 gm. per cent, 3 minutes, Lee-White clotting time 5 minutes, and prothrombin time (Quick) 15 seconds (control 13 seconds). The blood type was A Rh negative. A stained smear of the peripheral blood revealed a normal concentration of thrombocytes. A nasogastric tube was inserted; no gross blood was noted. A benzidine test performed on the gastric aspirate was faintly positive. After 1,500 cc. of banked blood had been rapidly infused, a blood volume determination (radioactive chromium^{51} tagged red cells) was obtained. The total blood volume was then 3,800 cc. with a plasma volume of 3,000 cc. and a red cell mass of 800 cc. The estimated normal blood volume based on 73 cc./kg. of body weight was 5,840 cc.

The initial diagnostic impression was one of hemorrhage from the colon and it was thought that with replacement of blood, the situation could be controlled. However, the continuing massive bleeding necessitating large volumes of blood to maintain

FIG. 1. In approximately the middle of the resected segment of jejunum, the inverted diverticulum is seen, clearly showing an ulcerated area. Recent hemorrhage was noted at the ulcer site in the fresh specimen.

the patient's vital signs indicated laparotomy. Ten thousand cc. of whole blood and 2,000 cc. of normal saline were required to stabilize his condition sufficiently to permit surgical intervention. His vital signs were then stable although his blood volume was only 4,228 cc. (3,340 cc. plasma; 886 cc. red cell mass) with a hematocrit of 21 per cent.

The platelet count had fallen to below 50,000 per cu. mm. against a normal in this laboratory of 450,000 per cu. mm. One hundred mg. of Solu-Cortef® was given intravenously and 2,000 cc. of fresh A Rh negative blood drawn in silicone treated equipment was transfused in order to correct the transfusion thrombocytopenia [2,6,9,10].

Sigmoidoscopy was performed immediately before operation. Copious amounts of fresh blood were coming from above the 25 cm. level. No lesion or generalized ooze were seen below.

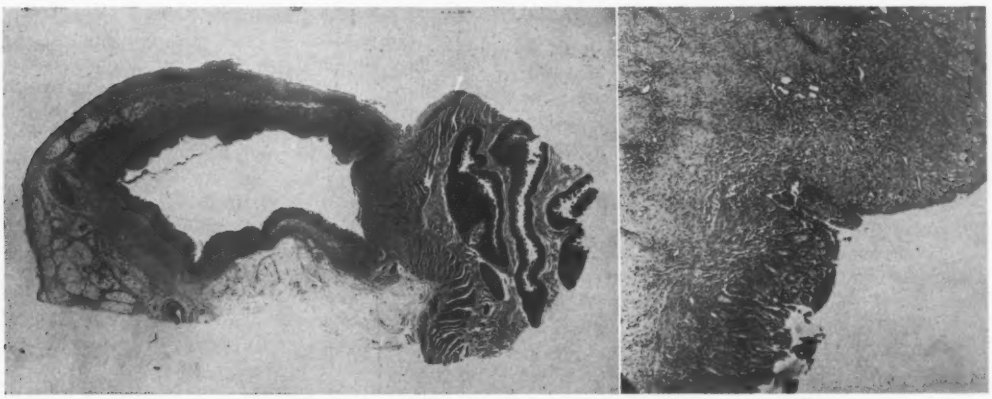
At laparotomy, the sole abnormality found was a single diverticulum approximately 50 cm. distal to the ligament of Treitz, on the mesenteric border (Figs. 1 and 2). This portion of the jejunum was excised and an end-to-end anastomosis was performed.

The immediate course was satisfactory. Bleeding ceased and the hemogram returned to normal. However, the patient remained febrile. The dosage of steroids was gradually reduced during the first postoperative week. No antibiotics were used. The wound healed per primum and ambulation was begun.

On the seventh postoperative day, the temperature rose to 40.6°C. and purulent drainage was noted at the site of the cutdown on the right leg. This material, as well as the blood culture, yielded Staphylococcus aureus hemolyticus (coagulase positive). Kanamycin therapy was begun and hypothermia was used to control the fever which had reached 41.1°C. The fever gradually subsided and the temperature remained normal after the thirtieth postoperative day. Antibiotics were discontinued on the forty-fourth postoperative day and his subsequent course was uneventful.

COMMENTS

Several cases of jejunal diverticula complicated by massive bleeding have previously been reported [3,8,11,13] and the problem of jejunal diverticulosis was thoroughly reviewed in a recent paper by Tidler and Miller [13]. Our case again emphasizes the life-endangering potential of the lesion and illustrates some problems in



2A 2B

FIG. 2. A, cross section of the diverticulum under low magnification. B, shows the margin of normal jejunal mucosa and ulcer base within the diverticulum. Approximately one-half of the circumference of the diverticulum is ulcerated. The base of the ulcer is composed of vascular granulation tissue which is infiltrated with chronic inflammatory cells.

the treatment of massive hemorrhage from any site. One of these was the effect of massive transfusion of banked blood. The degree of platelet depression may have been a consequence of the large quantity and rapid rate of infusion of such blood. Although the exact mechanism of this platelet depression is not altogether known, it is probably related to a combination of factors. These include the dilution of existing platelets by the rapid addition of blood which does not contain viable thrombocytes and the addition of a thrombocytopenogenic factor found in banked blood [*6,9,10*]. Fresh whole blood collected in silicone treated equipment or fresh frozen plasma known to contain active platelet substance are required to correct this deficiency, which by itself may aggravate the bleeding from the original lesion. However, there is evidence that simple thrombocytopenia may not be the sole cause for abnormal bleeding from massive transfusion [*5*].

Steroids were used to increase and maintain platelet levels. Although their effect on thrombocytopenia has been well documented, their mode of action has not been clarified. Current theories are that either destruction of thrombocytes is inhibited by counteraction upon circulating thrombocytopenogenic substances, or that production of platelets is enhanced by direct stimulation of megakaryocytes [*2*].

The use of steroids in this case was perhaps hazardous in itself. The infected cutdown site, which should have been of minor import, assumed major significance and probably was the portal of entry for septicemia, possibly because of the altered body response to infection under the influence of cortical steroids [*7*].

SUMMARY

1. A case of massive hemorrhage from a solitary jejunal diverticulum has been described. Pathologic identification of the site of bleeding is presented.

2. The potentially life-endangering complications of this lesion, although rare, make its inclusion in the differential diagnosis of massive gastrointestinal hemorrhage mandatory.

3. Management of thrombocytopenia associated with massive transfusion has been discussed.

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A Method of Approach to Colonic Hemorrhage

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The problem of massive hemorrhage from diverticula of the colon is apparently becoming more prevalent each year. The reason for this increase in incidence is no less confusing than the immediate problem that confronts the surgeon who treats such a patient. When the entire colon is involved with diverticula, localization of the bleeding point requires all one's surgical ingenuity. Solutions that have been suggested are total colectomy or multiple colotomies to locate the area of brightest bleeding, with resection of the area. For cases in which bleeding is less massive and resection less of a emergency, temporary transverse colostomy has been suggested followed by resection of the proximal or distal colon depending upon which side of the colostomy presents hemorrhage [*1*].

The purpose of this paper is to present a case which, due to the precarious condition of the patient, required transverse colostomy with certain embellishments. The procedure may be of use to others in similar circumstances.

CASE REPORT

This fifty-one year old white man was admitted to the hospital on May 12, 1956. For the past five weeks he had been bleeding from the colon. Over the past two weeks, at another hospital, he had received a total of 18 pints of blood, but had continued to bleed. X-ray films revealed diffuse diverticulosis of the colon, more prominent in the right colon.

When seen by us the patient was in a chronic state of exsanguination. Pulse was fast and thready. Both lower extremities showed massive pitting edema. Laboratory studies were as follows: hematocrit, 18 per cent; serum albumin, 2.2 gm. per cent; globulin, 2.2 gm. per cent.

For the next six days he received 1,500 to 2,000 ml. of blood per day. More vigorous transfusing resulted in cardiac decompensation despite digitalization. At the end of this period his condition was somewhat improved; edema had lessened; hematocrit had risen to 31 per cent, albumin to 2.7 gm. per cent. He was still in a precarious condition, however, and melena continued despite all conservative measures.

Therefore, on May 18, 1956, in order to localize the hemorrhage to one side of the colon, transverse colostomy was performed in the midline with the patient under local anesthesia. The transverse colon contained blood and presented diverticula, but nothing definitive was seen. No exploration was performed. The colon was quickly exteriorized over a glass rod in a brief procedure which required only twenty minutes. Despite the brevity and gentleness of the procedure, the patient withstood the operation poorly and it was apparent that any unplanned, prolonged exploration would have been disastrous.

For the next nine days rectal bleeding continued, but no blood came from the proximal loop of the colostomy. During this period he received 1,000 to 1,500 ml. of blood per day, but his condition never reached the point where he could have withstood total, definitive left colectomy. Over a period of four weeks he had received a total of 27,500 ml. of blood.

The bleeding point was therefore localized as far as possible by proctoscopy to 25 cm. by rectum and by colonoscopy to 25 cm. through the distal loop of the transverse colostomy by means of the proctoscope. No bleeding point being seen by these maneuvers, the site of hemorrhage was therefore localized to a relatively small segment of the left colon lying distal to the splenic flexure.

On May 27, the previously unvisualized segment of the left colon (approximately 20 cm. in length) was rapidly resected through a left rectus incision and the divided ends of bowel, sigmoid and distal splenic flexure were exteriorized. The procedure took less than an hour and was quite well tolerated. However, it was apparent again that further

manipulation would have been poorly tolerated. The resected specimen showed numerous diverticula and a microscopic subacute colitis. There was no gross or microscopic evident cause for the bleeding.

There was no further bleeding and thereafter recovery was rapid. He was readmitted five months later for resection of the remaining colon, all of which was involved with diverticula, and anastomosis of the ileum to rectum. His further course has been uneventful.

COMMENTS

In massive bleeding from the colon, relatively aimless exploration involving much manipulation and terminating in transverse colostomy, as a last resort, may be disastrously shocking to the patient. Certainly in the case reported herein such a procedure would have been intolerable, as would have been total colectomy no matter how expeditiously performed. For selected cases, therefore, the following procedure is suggested:

1. Planned transverse colostomy in the midline with no exploration of the abdomen. This can be performed with the patient under local anesthesia and is, of course, a minor procedure.

2. Localization of the bleeding point by use of the proctoscope, visualizing the rectum for 25 cm., the distal loop of the colostomy for 25 cm. and the proximal loop of the colostomy for 25 cm. By this means, either by exclusion or by visualization of the bleeding point, the origin of hemorrhage may be localized to a small segment of the colon.

3. Expeditious excision of the guilty segment.

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Reticulum Cell Sarcoma of the Small Bowel

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THE management of malignant tumors of the small intestine is frequently troublesome. First, diagnosis is often difficult, delayed or impossible because of the problems inherent in the radiologic interpretation of lesions of the small bowel. Because of the length, tortuous loops and constant motion of the intestine, lesions within it are often concealed. Second, symptoms of malignancy of the small bowel, save for those which produce obstruction, are likely to be interpreted as being the result of diseases elsewhere in the intestinal tract. From a statistical standpoint alone, hemorrhage, anemia and vague abdominal stress in the absence of obstruction are usually attributed to lesions in other areas. Third, even when gross hemorrhage is a major factor in the history, one usually thinks of hemorrhagic processes in the lower esophagus, stomach or duodenum, even if the results of repeated radiologic studies of these areas are negative or inconclusive.

The case presented herein illustrates the latter point. Multiple roentgenologic studies of the upper gastrointestinal tract and large intestine were performed during a period of several months in an effort to diagnose the cause of severe intestinal bleeding. Even though a malignant tumor of the small intestine was in a relatively far advanced state, its presence was nearly overlooked in the last studies made of the upper gastrointestinal tract.

CASE REPORT

A seventy-six year old man was admitted to the University of California Hospital on January 22, 1958. He had been a chronic invalid for nine months, mainly from the effects of massive repeated intestinal hemorrhages. Each of the episodes of bleeding had been treated by multiple transfusions of whole blood and conservative management during the most severe periods of illness which required hospitalization. The patient had been treated with a modified ulcer diet between hospital admissions.

Three roentgenologic studies of the upper intestinal tract were performed elsewhere in June, September and December of 1957. None of these showed evidence of disease. Barium enemas performed in September and December 1957 revealed no abnormality. Other studies had also been made in an effort to discover the source of the massive intestinal bleeding, which was manifest at all times by the passage of tarry stools and on two occasions by tarry stools mixed with bright red blood.

At the time of admission to this hospital the patient was extremely weak, and he showed the effects of a prolonged illness. The main findings were limited to the abdomen. A suggestion of an ill-defined fullness was present in the left portion of the abdomen at the level of the umbilicus.

A barium enema performed as the initial radiologic study was normal. Results of a study of the stomach, duodenum and small bowel were normal except for an apparent irregularity in the small bowel. The change in contour was noted on only one film of the many obtained in the radiologic series. (Fig. 1A.) A repeated study directed toward this area verified the presence of a mass involving a rather long segment of small bowel. (Fig. 1B.) It was quite possible that the discovery of this irregularity on the initial roentgenologic study here was a fortunate coincidence since no obstruction of the area existed, nor was the flow of barium significantly altered in speed or course at this juncture.

After suitable preparation with transfusions of whole blood and general supportive care, laparotomy was performed on January 28, 1958. A mass was found in the small bowel at the junction of the jejunum and ileum. The tumor had progressed to such a state that several loops of small bowel were drawn into the substance of the tumor, and a fistula was present between adjacent loops of bowel at one point. The mass measured 12 cm. in length, 8 cm. in width and 6 cm. in thickness. Part of its volume was composed of adherent loops of bowel. (Fig. 2.) Numerous lymph nodes were found in the mesentery. These varied in size from a few millimeters up to 4 cm. The metastatic masses in the mesentery extended throughout its entire sur-

1A

1B

FIG. 1. A, note narrowed linear segment of small intestine, lateral to descending colon. B, second study with special emphasis on left lower quadrant of abdomen, which demonstrated extensively involved area of small intestine.

FIG. 2. In gross specimen, linear nature of lesion is evident. Ulceration had occurred in several areas of tumor but most of lesion was covered with intact mucosa.

face and involved all segments of the mesentery of the entire small bowel. There were no identifiable metastases to the liver.

In order to prevent further massive hemorrhages from the lesion, resection of the small bowel was performed. As much of the involved mesentery was removed as was compatible with the blood supply of the remaining bowel. This was considered at the time to be a palliative resection. It was hoped that the patient's general condition would be improved by preventing further loss of blood, and that the growth of the remaining metastatic deposits would be inhibited. A course of nitrogen mustard therapy was administered late in the postoperative period.

Pathologic examination of the specimen showed numerous metastases to the mesenteric lymph nodes. Cross sections of the tumor showed an intact mucosa in most areas. (Fig. 3.) Histologic studies demonstrated the typical picture of a reticulum cell sarcoma. (Figs. 4 and 5.)

The patient's immediate postoperative course was satisfactory, and he was quite well for six months. About the seventh month after operation

FIG. 3. Cross section of portion of tumor. Note that mucosa is intact in some areas overlying tumor (arrows) and eroded in others (semicircle).

his condition began to deteriorate rapidly. He was admitted to the hospital for terminal care. At this time he had abdominal ascites, generalized weakness and evidence of spread of malignant disease throughout the abdominal cavity.

An autopsy showed extensive mesenteric lymphatic metastases as well as deposits on the peritoneum, within the prostatic gland, and in both kidneys and the perinephric fat. The liver was free from metastases as were the lungs.

COMMENTS

Reticulum cell sarcoma, a form of lymphosarcoma, is probably the rarest malignant lesion of the small bowel. The lesion is highly malignant. Although its behavior pattern is similar to that of lymphosarcoma, it occasionally may be localized, which justifies its radical removal [1]. Lymphoid tissue, consisting of a connective tissue reticulum along with aggregates of lymphoid cells contained within it, is located throughout the intestine as isolated areas in the mucosa, and is also arranged in patches in various areas. Most

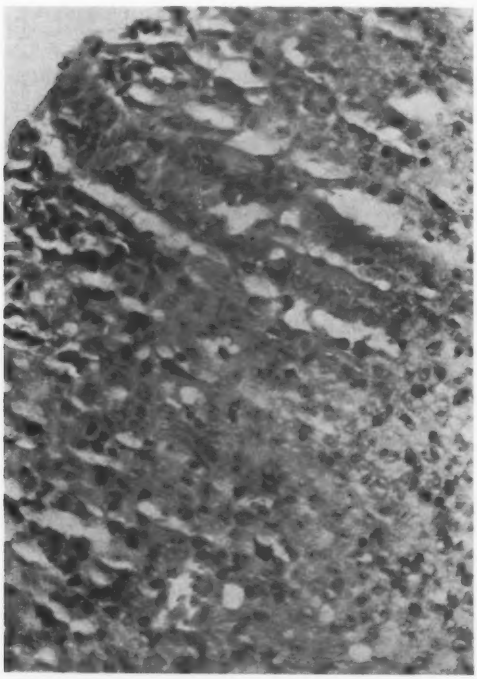

FIG. 4. Microscopic section of portion of tumor in area of erosion of mucous membrane. Cytoplasm is abundant and demonstrates more pleomorphism than does lymphosarcoma. Note large nuclei. Hematoxylin and eosin stain.

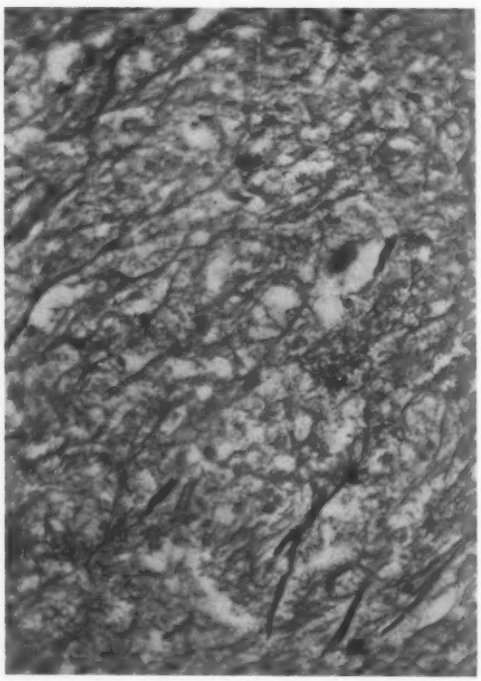

FIG. 5. Pathognomic reticulum is shown in silver-stain preparation. Amount of reticulum is increased and intimately related to cells of tumor.

observers believe that malignancies of this tissue arise in the lymph follicles in the submucosa [5]. From this point of origin the tumor spreads by direct extension in the long axis of the bowel. Since it arises in the deeper layers, ulceration is not common. When ulceration does occur, it results from necrosis of the overlying mucosa, largely by virtue of the bulk of the mass rather than by malignant invasion of the mucosa, although both mechanisms can occur.

Probably because of the greater accumulation of lymphoid tissue in the cecum and ascending colon, lymphomas in this area tend to be polypoid, while those in the small intestine are more likely to be diffusely infiltrative, possibly because the aggregates of lymphoid tissue are more scattered here than elsewhere. Intussusception is not uncommon even in those lesions arising in the small bowel [2,4].

The origin of these lesions in the submucosal regions and the lack of intraluminal involvement until late in their development suggests that obstruction is the exception rather than the rule. For this reason the predominant symptom in lesions of this type is caused by ulceration produced by the bulk of the tumor eroding through the mucosa of the bowel at a late stage in the development of the tumor. This symptom is, of course, hemorrhage which is usually massive.

Vague abdominal distress bordering on true but incomplete symptoms of obstruction is often dismissed from consideration when the patient's history is obtained. This was indeed true in a recently reported series [3]. In a study of thirty-two patients, the symptoms produced by these tumors were of two main types: (1) obstruction, which was usually incomplete, causing vague but crampy abdominal pain; and (2) occult or severe loss of blood which was intermittent.

Reticulum cell sarcoma apparently has no special predilection to the small bowel for its development. The presence of reticulum throughout the body permits the development of malignancy in any location in about the same statistical order of magnitude, except in bone.

Radiologic diagnosis of tumors of the small bowel is difficult. The tortuosity of the considerable length of small bowel along with its constant movement allows overlapping of loops of intestine and leads to difficulty in the diagnosis.

Tumors of the small bowel unfortunately are not always recognized even at the time of laparotomy. Wilkie [6] reported three instances in which the gallbladder, appendix and adhesions were removed as the most likely cause of the patient's symptoms, even though a tumor of the small bowel existed at the time. It is also important to realize that even in the presence of a known reticulum cell sarcoma of the small intestine, the presence of enlarged mesenteric lymph nodes does not necessarily indicate that they are involved by metastatic cancer. Mesenteric lymph nodes in one-half the bowel resections performed in a recent series [7] did not demonstrate malignant metastatic involvement.

The present case report indicates that constant vigilance and awareness of the possibility of a tumor of the small bowel as a cause of symptoms will perhaps do more to uncover early lesions than any other single method. The prognosis (which is poor at best) can be improved only by discovering these lesions at an early stage of their development since treatment at a late date is so ineffective.

SUMMARY

A case of reticulum cell sarcoma of the small intestine is presented. Repeated radiologic studies failed to demonstrate the lesion, although it was in an advanced stage of development at laparotomy. The possibility of a tumor of the small bowel should always be kept in mind even if roentgenologic studies of the upper gastrointestinal tract appear normal in patients with vague abdominal distress and hemorrhage.

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A Case of Carcinoma of the Breast in a Young Woman with Hamartomatous Hypothalamic Malformation

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A GREAT majority of women with carcinoma of the breast have functional or morphologic endocrine abnormalities of the ovary, anterior pituitary lobe, adrenal cortex or thyroid gland. A few, approximately 2 per cent in one series studied pathologically, had no such change [1]. In a histopathologic survey of the human hypothalamus with stains for neurosecretory material, a case of cancer of the breast in a twenty-seven year old woman who proved to have a malformation of the hypothalamus was included.

Mammary carcinoma in women under thirty is quite uncommon. Warthin [2] (1915) reported that 9.7 per cent of 2,000 cancers of the breast occurred in this age group, but in subsequent series are estimates that less than 3 per cent of affected women are less than thirty years of age. Among 303 cases in patients in the age group of twenty to forty years, Lee [3] reported nine cases in patients twenty-one to twenty-five years of age (3 per cent) and forty-two cases in patients twenty-six to thirty years of age (14 per cent). Hall and Bagby [4] reported on cancer of the breast in two twenty-two year old patients, four patients who were twenty-two to twenty-six years of age, and eighteen from twenty-six to thirty years old. Haagenson and Stout [5] found eighteen women less than thirty years old among 1,040 patients with cancer of the breast. Willis [6] reported two women twenty-three and twenty-nine years of age among ninety-two subjects with cancer of the breast who were autopsied. MacDonald [7] reviewed 2,636 cases and found thirteen in patients less than twenty-five years old and sixty cases in patients who were from twenty-six to thirty years old.

Cancer of the breast in childhood has been reported by Sears and Schlesinger [8] in a girl ten years of age, by Peck [9] at twelve years, and by Hartman and Magrish [10] in a six year old boy with elevated urinary 17-ketosteroids and corticoids. The last authors reviewed the literature and cited additional reports by Puente-Duany and Garcia-Ramirez [11] of carcinoma in a girl eleven years of age, Smithy [12] of a mixed sarcoma and carcinoma in a ten year old Negro girl, Bryan [13] in a boy fifteen years of age, Simmons [14] in a boy thirteen years old, Krauss [15] of bilateral carcinoma of the breasts in a twenty year old woman, together with two other cases previously cited by Sears. A carcinoma in an eighteen year old girl was also noted in the literature [16].

In young patients with cancer of the breast, thorough pathologic study usually has either not been made or has revealed no evident endocrine peculiarities, except in the case reported by Zondek [17], that of a twenty-six year old woman after estrogen therapy. She had an eosinophilic hyperplasia or adenoma of the pituitary gland, endometrial hyperplasia and inactive ovaries.

CASE REPORT

L. H. (MMH 379804), a white, married, gravida v, Para iv, housewife, was first seen when she was twenty-seven years of age in August 1954. Her only complaint was of a lump in her right breast. She had noticed the mass approximately eleven weeks prior to admission during the last month of her fourth pregnancy. She did not mention it to her

physician, but when the lesion failed to regress following delivery she was treated with antibiotics. The mass was unaffected, and when she developed the gradual onset of vague, dull pain beneath her right breast she was admitted for biopsy.

She had always been in excellent health, bore her children without incident, and had not breast fed them. A review of her past history revealed that she had measles and chicken pox as a child. She had been married for ten years. The father, mother, one brother and all offspring were living and well. There were no familial diseases. Catamenia began at age thirteen, with regular periods every twenty-eight days requiring four to five pads daily. Her weight had been constant at 120 pounds.

Physical examination revealed a normally developed, well nourished, blonde woman, who appeared to be healthy, with cancerophobic anxiety. Vital signs were within normal limits. Examination was completely normal except for a walnut sized, hard, painless, movable mass just lateral to her right nipple. The overlying skin was freely movable, without discharge from the nipple, and with questionably palpable nodes in the right axilla. Pelvic examination was normal. No endocrine abnormality was evident.

Laboratory data were as follows: hemoglobin was 13.0 gm. per cent, white blood count was 5,500 per cu. mm. with a normal differential count, blood urea nitrogen was 16 mg. per cent, total protein was 7.7 gm. per cent (A/G ratio 3.7/4.0), alkaline phosphatase 2.4 units (Bodansky), phosphorus 3.8 mg. per cent, blood type B, Rh positive, urinalysis negative. Roentgenograms of the chest and metastatic series were negative.

Frozen section revealed carcinoma and a right radical mastectomy was performed. Pathologic diagnosis was adenocarcinoma of the breast, partly scirrhous and partly medullary. Four of eight lymph nodes from the proximal axilla contained tumor and no tumor was found in five nodes of the distal axilla. The uninvolved right breast showed no evidence of fibrocystic disease. The postoperative course was uneventful.

In February 1955, approximately six months after surgery, she complained of pain in the left hip. Roentgenographic studies revealed several osteolytic defects of the bony pelvis. She was admitted for the second and last time in April 1955, because of severe, constant pain in the left hip, cervical spine and right anterior ribs. Examination at this time revealed an anxious, thin, poorly cooperative, acutely and chronically ill female complaining of constant pain. There was tender nodular enlargement of the ribs under the mastectomy scar. She was unable to sit up because of pain. The liver was palpable below the umbilicus. Her last menstrual period had been in December, 1954.

Roentgenograms at the time revealed coarse bilateral peribronchial infiltrates and multiple extensive osteolytic lesions of pelvic bones, femora, and vertebrae with compression fractures of the vertebrae. A uterus comparable to a two to three month pregnancy was palpable, and a frog test was positive. Interruption of the pregnancy together with bilateral oophorectomy and possible adrenalectomy were planned, but her rapidly deteriorating course prevented this. A course of oral cortisone therapy was instituted in April, 1955, starting with 200 mg. daily and decreased daily thereafter. Follicle-stimulating hormone studies gave positive reactions for 6.6, 13.2, 26.4, 52.8, and 105.6 mouse units per 24 hours. Other significant data were serum calcium 7.9 mEq./L., phosphorus 4.6 mg. per cent, alkaline phosphatase 10.9 units (Bodansky), sugar 94 mg. per cent, and white blood count 18,000 per cu. mm.

A febrile course developed with temperatures up to 105°F. She became delirious and died near the end of April 1955, approximately ten months after her awareness of the mass in the breast.

At autopsy the body was that of a cachectic, white female with metastatic tumor extensively infiltrating the entire vertebral column and pubic bones with nodules measuring up to 4 cm. in the ribs beneath the mastectomy scar. The liver weighed 2,450 gm. and approximately 85 per cent of it was replaced by tumor. The left breast was moderately enlarged as in pregnancy. The pancreas weighed 70 gm. and appeared normal. Small accessory spleens were present. The adrenals together weighed 12.5 gm. and were not remarkable. The thyroid appeared normal and weighed 25 gm. The uterus contained a fetus measuring 9.5 cm. crown to rump (14½ weeks, menstrual age). The ovaries were described as being normal. Other organs were not remarkable. The brain weighed 1,400 gm. and was completely negative grossly.

Microscopically the carcinoma of the breast consisted of widely infiltrating, irregular, large cells with large hyperchromatic and vesicular nuclei, with a small amount of eosinophilic staining cytoplasm, arranged in solid cords and islands. (Fig. 1A.) Nucleoli were prominent. Large numbers of atypical mitotic figures were present. Fibrosis and necrosis were prominent.

The cervix, tubes, and pregnant uterus were of normal appearance. Subserosal decidual cell formation was seen in the ovaries with abundant corpora albicantia and cortical stroma. The tissue of the left breast was composed of a normal fibro-fatty stromal matrix with early ductular arborization and acinar secretory foci consistent with pregnancy.

A striking increase in the number and size of the islets of the pancreas was found. Many very small islets and also giant islets measuring up to 540 μ were present. (Fig. 1B.) The ducts and acini appeared unremarkable. The adrenal cortex was of the

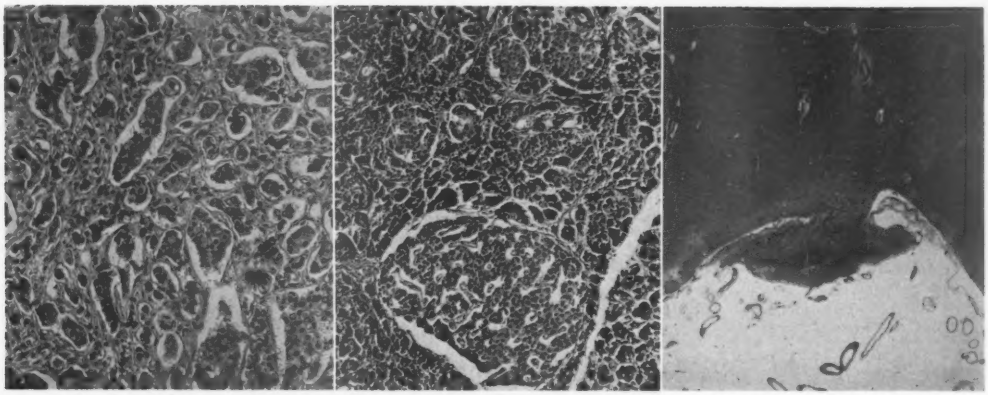

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FIG. 1. A, carcinoma simplex of breast, from the surgical specimen. Hematoxylin and eosin, original magnification × 125. B, pancreatic islet hyperplasia is shown, with one giant islet and several small islets. Hematoxylin and eosin, original magnification × 90. C, hamartomatous malformation of the right posterolateral hypothalamus is demonstrated. A portion of the tuberal nucleus is shown to the left of the lesion, with the basis pedunculi at the extreme right. Klüver stain, original magnification × 30.

usual thickness, with a few nodules in the zona fasciculata, and poor in lipoid. The thyroid was of regular structure with abundant colloid and its epithelium was mostly cuboidal with a few columnar papillary foci.

Aside from individual trophoblastic giant cells in alveolar capillaries, the lungs showed only congestion and atelectasis. The kidneys were within normal limits. The aorta was negative. The liver contained metastatic deposits of various sizes, and the portal areas and bile ducts showed no lesions.

The carcinoma was classified as a poorly differentiated adenocarcinoma, so-called simplex, infiltrated by lymphocytes and with invasion of blood vessels and lymphatics. The largest metastases were centrally degenerated with replacement by hyaline connective tissue.

Sections of cerebral cortex and brain stem were negative, except for increased size and number of satellite glia. The pineal gland was normally cellular, the cells containing large nuclei and abundant cytoplasmic pigment, without degeneration.

The pituitary cell count of the anterior lobe (10,553 cells counted) revealed 50.7 per cent acidophils, 9.2 per cent basophils, 12.7 per cent amphophils, 26.4 per cent chromophobes, 0.8 per cent hypertrophic amphophils, and 0.1 per cent hyaline basophils. Erdheim pregnancy cells were rare. A small cyst of the intermediate lobe was present.

The entire right side of the hypothalamus was serially sectioned in a sagittal plane. Sections were approximately 8 μ thick and numbered from No. 1 to No. 891. Every tenth and eleventh sections were stained with the Pearse periodic-acid-Schiff-trichrome and Klüver myelin stains, respectively. Additional representative sections were stained with chrome-alum-hematoxylin (CAH) and aldehyde fuchsin.

In the lateral one-third of the hypothalamus, lateral to the medial mammillary nucleus (beginning with section No. 690 and extending to section No. 800) at the most posterior aspect, was a small, ovoid, somewhat flattened projection of tissue measuring 2.5 mm. in the anterior-posterior dimension, 1.2 mm. in depth and 1.0 mm. wide. (Figs. 1C and 2.) Levels taken through the left half of the hypothalamus revealed a lesion, similar in all respects, including point of origin. (Fig. 3.)

The projecting nodules consisted of a peripheral larger zone of relatively acellular tissue comprising dense glial and connective tissue elements with occasional astrocytes and rare large nerve cells. The stalk and smaller core of the lesion consisted of clusters of uniformly sized nerve cells which appeared similar to those of the nucleus represented in the area immediately above it. They were elongated, somewhat ovoid cells measuring up to 35 μ in length, averaging 28 μ in length. Distinct vesicular, slightly eccentric nuclei of uniform size were present measuring 13 μ in greatest dimension. The nucleoli were prominent, nuclear and cell membranes were distinct, with perinuclear clumps of intracytoplasmic granules present. An occasional cell demonstrated the tigroid appearance of Nissl substance. The granules, probably lipochrome, were of uniform size and stained bright red with the periodic-acid-Schiff stain, and deep blue with the Klüver method. Aldehyde fuchsin and chrome-alum-hematoxylin stains revealed the same granular pattern, but without positive staining of axonal granules or "beading." Rare cells with intracyto-

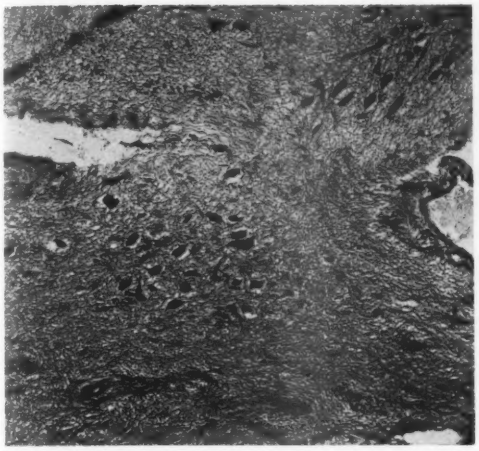


FIG. 2. The stalk of the malformation is shown at higher magnification, with nerve cells above and below the junction of the hamartoma and the hypothalamus. Klüver stain, original magnification × 120.

FIG. 3. A similar malformation of the left posterolateral hypothalamus is illustrated, located between the tuberal nucleus to the left and the basis pedunculi at the right. Hematoxylin and eosin, original magnification × 30.

plasmic "colloid" globules were seen with chrome-alum-hematoxylin stain. (Fig. 4.)

The nerve cells were interpreted as being derived from the tuberomammillary nucleus. They were larger and contained fewer granules than those of the nearby tuberal nuclei and were slightly smaller and not as irregular as those of the lateral mammillary nuclei. The hamartomatous nodules contained myelinated fibers haphazardly arranged in the periphery. In the stalk, however, bilaterally, a distinct bundle of myelinated fibers passed into the parent tissue and radiated to the subthalamus and basis pedunculi, where they were soon lost. (Fig. 5A.) The larger portion of the tract appeared to enter the basis pedunculi. The bilateral nodules appeared to be invested by pia arachnoid, and blood vessels could be seen bridging the lesion. Medially, the peripheral relatively acellular medial extensions of the hamartomas rested against the posterolateral aspect of the medial mammillary nucleus and became indistinguishably fused with its pia arachnoid. No myelinated fibers could be seen bridging in this area.

An interesting associated finding in this case was a focal and also diffuse thickening of the meninges, due to piling up of the subpial and marginal glia. A few areas of accumulated astrocytes, scattered myelin fibers, with rare nerve cells were seen, simulating so-called "glial heterotopia." (Fig. 5B.) One separated nest was found invested by pial membranes. (Fig. 5C.) Due to breaks in the continuity of tissue blocks, the relationship between the hamartomas and the glial heterotopia could not be determined. The remainder of the hypothalamus was not remarkable except for occasional pyknotic cells of the medial mammillary nucleus. The paraventricular and supraoptic nucleus demonstrated "colloid" vacuoles and neurosecretory material with the special stains.

Section of the hypothalamus of the fetus revealed badly autolyzed tissue with no abnormalities of a congenital nature suggested.

COMMENTS

The case reported in essence is that of a fertile young woman who died of widespread

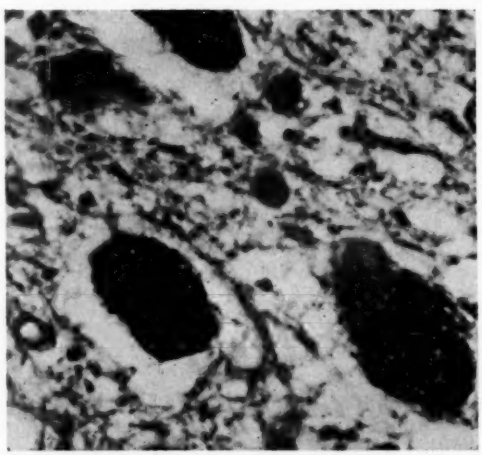
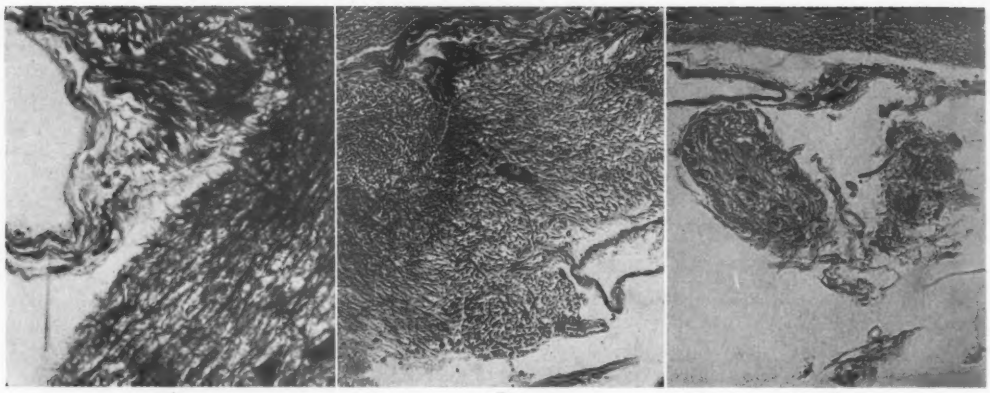


FIG. 4. Stain for neurosecretion, demonstrating an intracytoplasmic pale staining "colloid" globule in the cell at lower right. Chrome-alum-hematoxylin stain, original magnification × 900.



5A 5B 5C

FIG. 5. A, finely myelinated fibers are shown in the stalk of the malformation. Klüver stain, original magnification × 430. B, a focus of glial heterotopic tissue in the meninges is evident, with a large nerve cell in the center. Klüver stain, original magnification × 150. C, pia membranes are seen surrounding a nest of heterotopic glial tissue. Klüver stain, original magnification × 180.

carcinoma of the breast. Autopsy revealed no abnormalities grossly aside from those of widespread cancer and pregnancy. Breast tissues uninvolved by carcinoma appeared normal. Microscopically the endocrine glands were within normal limits, except for pancreatic islet hyperplasia. Pituitary cell count showed an increase of the acidophils, which is considered normal in pregnancy, decrease of basophils, and an increase in hyaline basophils (Crooke cells) attributable to the cortisone therapy. The hypertrophic amphophil cells, which are usually increased accompanying invasive cancers, occurred in normal numbers [*19*].

In the absence of other significant endocrine abnormalities, the hamartomatous malformation of the hypothalamus was the chief finding that might be correlated with this case of carcinoma of the breast.

References linking the hypothalamus and cancer are few. Brocali [*20*] cited four cases of leukemia in which the ganglion cells were in states of hypofunction or exhaustion, notably in the supraoptic, paraventricular, hypothalamoventricular and tuberal nuclei. Marked proliferation of the glial component, both astroglial and microglial, with ependymal metaplasia and thickening were also seen. De Gaetani [*21,22*] implicated impaired functions of the vegetative nuclei of the hypothalamus as playing a role in the development of cancer. In early cases of cancer, he noted hyperfunction of the ganglion cells and the glia of the hypothalamus, and in advanced cases regressive phenomena of the nervous and glial cells. He treated a heterogenous group of twenty patients with advanced metastatic malignant tumors by X-ray irradiation to the diencephalon, and observed clinical improvement in the size of the neoplastic mass [*23*].

Approximately twenty cases of hamartomas of the hypothalamus are reported in the literature [*24–35*]. All except one of these were limited to infants and children [*28*]. The exception was a twenty year old male with endocrinologic symptoms ascribable to the lesion that began at age five. These cases, with six possible exceptions [*28,31*], were associated with pubertas praecox, as are various other tumors of the hypothalamus. Since five instances of hypothalamic malformation were found in stillborn infants or small children, it is not possible to conclude that pubertas praecox would not have developed, and in the remaining case, in a patient twenty years of age, Schmidt and coworkers [*28*] thought that an abortive type of precocious puberty could not be excluded.

The hamartomas previously reported unassociated with precocious puberty arose in four cases from the tuber cinereum caudad to the hypophyseal stalk insertion, and were from 0.6 cm. to "cherry-sized." One hamartoma was a rounded mass measuring 2.5 cm. intimately attached to the optic chiasm, filling the interpeduncular fossa and occupying the infundibular region. The other was a large well circumscribed

mass at the base of the brain, extending from just caudal to the optic chiasm to the level of the upper medulla oblongata.

The posterior and tuberomammillary hypothalamic regions and their incorporated small cells are thought to constitute an important center of the sympathetic nervous system [36]. This general region is also concerned with gonadotropic function and with the sleep-wake cycle because of its association with the upper end of the reticular substance. Experimental somnolent periods were produced in monkeys with localized lesions in the caudal hypothalamus and rostral midbrain tegmentum [37]. The mechanism of action in regard to gonadotropic function raises three possibilities: (1) direct neurosecretory function; (2) influence on gonadotropic function by neural pathways; and (3) direct neural pathways to the gonads by way of the spinal cord and autonomic pathways. The tuberomammillary nucleus has been found to contain intracytoplasmic "colloid" globules, such as were seen in the present case [24]. This would conform to the first of the three possibilities above.

In a review of sixteen cases of pubertas praecox [25] associated with destructive lesions, thirteen were found to have the greatest damage in the caudal portion of the hypothalamus. It was postulated that coincident with the damage to the caudal hypothalamus an anterior hypothalamic mechanism was released, causing an increase in gonadotropic hormone. The authors felt that the posterior hypothalamus was associated with estrus and mating in animals and that in lesions of the anterior hypothalamus, hyposexuality occurred. Harris [38] found that experimental destructive lesions in the general region of the posterior hypothalamic connecting tracts were followed by an enhanced estrus activity, as if gonadotropic functions were normally held in check by nervous tract functions in this part of the brain. Bilateral lesions in the posterior hypothalamus in the rat, however, were not associated with any gonadal or genital changes in one further study [39]. In small, nondestructive lesions such as in the present case it would be difficult to invoke the theory of release of inhibition. Further discussion on the functional mechanism of hamartomas and destructive lesions of the hypothalamus is given by Schmidt et al. [28], Stotijn and Nauta [29], and Richter [30].

This apparently is the only recorded case of hamartomatous malformation of the hypothalamus in an endocrinologically normal subject of adult age. Another unique feature is the localization of the malformation in the posterolateral hypothalamic area, since the majority arise from the tuber cinereum caudad to the insertion of the hypophyseal stalk. In the state of present knowledge no conclusions can be reached, but it is interesting to speculate on the role, if any, which this small localized malformation played. Since the cancer of the breast evidently did not arise in pre-existing fibrocystic disease, and no pituitary-ovarian changes of hyperestrinism were discovered, the possible influence of another carcinogenic mechanism, such as "mammotropic" stimulation under hypothalamic influence, might be invoked. An alternate explanation would be that some carcinomas of the breast arise from unusual epithelial overgrowths in an otherwise normal breast in a normal hormonal environment, and that the hypothalamic malformation was merely an uncorrelated anatomic curiosity.

SUMMARY

Small symmetrical bilateral hamartomas of the hypothalamus are reported, considered to be an excess of posterolateral hypothalamic tissue, probably the tubero-mammillary nucleus, in a twenty-seven year old woman with carcinoma of the breast. A well defined myelinated bundle connected each lesion to the parent tissue. This is thought to be the first report of a hamartoma of the hypothalamus in an adult without obvious endocrinopathy. The possible significance of the malformations in the presence of cancer of the breast and in the absence of endocrine findings usually accompanying it is discussed.

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Osteogenic Sarcoma of the Mandible

A METHOD OF TREATMENT

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TUMORS of the mandible, by virture of their anatomic location, are brought to the attention of the surgeon relatively early in their growth. However rare osteogenic sarcoma of the mandible may be, the survival of the patient affected by it may largely depend on the promptness with which the lesion is diagnosed and how adequately it is treated. Slaughter [7] pointed out a few years ago that the angle of the mandible has been the "no man's land of the surgical specialties. The general surgeon, the therapeutic radiologist, the plastic surgeon, the otolaryngologist, and the oral surgeon, all meet warily at this anatomic point with the result that none has staked a valid claim." With certain exceptions this has remained unchanged. Professional philosophies, the rarity of the lesion and, as Coley [2] admonishes, "the attitude which seems all too prevalent that this disease is uniformly fatal and that therapy is of so little value, all call for no great effort to reach an early diagnosis and to institute prompt, appropriate treatment." A high index of suspicion and close cooperation between all interested specialists should lead to a more optimistic outlook.

Except for sporadic case reports, osteogenic sarcoma of the mandible is usually grouped along with other osseous structures in surveys of bone tumors presented by orthopedic surgeons and pathologists. Controversies regarding nomenclature and classification have obscured the literature so that an accurate compilation of cases is impossible; however, it has been estimated that one of every 100,000 persons in the United States has a sarcoma originating in bone [3]. Of these tumors, approximately 0.5 to 7 per cent arise in the mandible, or, roughly one person in 1,400,000 suffers from this disease. More recently, Richards and Coleman [5] have critically reviewed some fifty cases of reported osteogenic sarcoma of the mandible. They found only seventeen which could be accepted as valid cases of osteogenic sarcoma according to rigidly set criteria.

Clinical, as well as histologic and roentgenologic diagnosis, is difficult, since it may be confused with such benign conditions as the florid phase of myositis ossificans, fibrous dysplasia, ossifying fibroma (although mitotic figures are present, no anaplasia is observed), osteogenic fibroma and odontogenic fibroma.

Cade [1] advocates primary radiation therapy for all osteogenic sarcomas based on a series of 133 cases. He assumes that the local tumor can be controlled by radiation so that metastasis will not occur. He further stated that the survival rate in osteogenic sarcoma is in direct proportion to the amount of radiation given to the primary tumor. However, Coventry and Dahlin [4], in a review of 430 patients, point out that early surgical ablation has given them the best results, or a 20 per cent average five-year survival.

Sharp [6] in 1933 advocated the combined use of radiation and surgery. The radiation used was both the external type and interstitial radon implants. A tumor dose of 10 minimal skin erythema doses was used.

In the light of present day knowledge concerning the radioresistant character of these tumors, this amount of radiation is believed to be inadequate.

CASE REPORTS

CASE 1. This thirty-two year old white woman's chief complaint was recurrent tenderness and swelling of the left mandibular cuspid area of two

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FIG. 1. Case 1. Firm, expanding lesion of labial alveolar ridge, involving left mandibular incisor and cuspid teeth.

FIG. 2. Case 1. Roentgenogram suggesting bony resorption mesial to cuspid tooth. In no films was there evidence of "sun ray" effect.

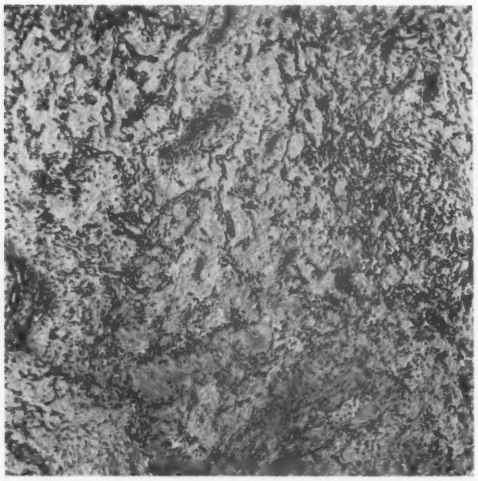

FIG. 3. Case 1. Photomicrograph of second biopsy specimen.

FIG. 4. Case 1. Appearance twelve months following radical surgery.

months' duration. Excisional biopsy of a 1.5 cm. lesion was interpreted on microscopic examination as ossifying fibroma, fibrous dysplasia or a possible osteogenic sarcoma. The lesion recurred in six weeks and the patient was transferred to Walter Reed Army Hospital. Roentgenograms showed an osteolytic process adjacent to the root of the cuspid tooth. Osteogenic sarcoma was diagnosed on a second biopsy. (Figs. 1 to 3.)

A single-plane five-needle radium implant was inserted through the tumor into the body of the mandible. Each needle had an active length of 3.3 cm. containing 1.33 mg. of radium per 1.1 cm. The inferior border of the mandible was crossed with two needles totaling 5.5 cm. and containing the same amount of radium per 1.1 cm. The total dose was 3,036 mg. hours; the maximal tumor dose was 11,040 gamma r, while at the edges of the implant the minimal dose was 7,000 gamma r. This dose was theoretically calculated rather than actually measured. An acrylic splint was fabricated and placed over the needle implants to protect the adjacent soft tissues from the radiation.

Twenty-four hours after removal of the radium, the tumor was excised with an adequate margin as determined by multiple frozen sections. The pro-

FIG. 5. Case II. Circumscribed, superficially ulcerated, expanding tumor.

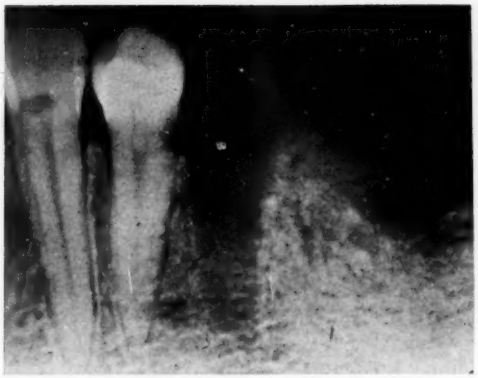

FIG. 6. Case II. Typical "sun ray" effect at crest of alveolar ridge posterior to site of previous tooth extraction.

cedure consisted of left hemimandibulectomy including the symphysis and adjacent soft parts. It was thought necessary to ligate the external carotid artery and include the suprahyoid structures on the affected side.

The patient's postoperative course was uncomplicated. To date, she has no evidence of active disease thirteen months after surgery. Weight is being maintained with normal diet and without any significant mandibular dysfunction. Cosmetic reconstruction is now being considered. (Fig. 4.)

CASE II. This eighteen year old white woman had had a painful swelling in the right mandibular region of four weeks' duration. The right mandibular second bicuspid was extracted two weeks after the onset of disease. (Fig. 5.) Increased swelling and pain followed which interfered with mastication. Roentgenograms revealed new bone formations on the alveolar ridge. (Fig. 6.) Osteogenic sarcoma was diagnosed following excisional biopsy performed four weeks after the onset of the symptoms. (Fig. 7.) The patient was transferred to Walter Reed Army Hospital.

A single-plane six-needle radium implant was inserted. The active needle length and quantity of radium was identical with that used in Case I. No inferior border needles were employed. The total dose was 2,640 mg. hours; the maximal tumor dose was 10,900 gamma r, whereas at the corners the minimal dose was 7,910 gamma r. This dose was also theoretically calculated. (Fig. 8.) Shortly after the removal of the radium, the tumor was resected in the same manner as in Case I. In this instance, however, the mandible could be transected at the symphysis.

The patient's postoperative course was uncomplicated and excellent mandibular function was obtained. To date, she has no evidence of active disease nine months following surgery. Cosmetic

FIG. 7. Case II. Photomicrograph of biopsy specimen.

reconstruction will be considered at the end of one year. (Fig. 9.)

COMMENTS

We have combined both forms of treatment as perhaps the best approach to this problem in the mandible. From the various methods of radiation available, intratumoral therapy would seem to be the best for this anatomic site. We believe that by necessity the radiation must be given as a necrotizing dose in the shortest time interval practicable. Since immediate extirpation of the tumor is necessary following radiation, any form of external treatment is contraindicated. We believe that radium element

FIG. 8. Case II. Interstitial radium implant.

FIG. 9. Case II. Appearance nine months following radical surgery.

needles placed in and about the mandibular tumor best fulfill the aforementioned criteria.

Objections may be raised to the traumatic placement of radium needles through the tumor. However, the dissemination of tumor cells with this interstitial radiation (both intratumoral and intraosseous) should not spread tumor any more than a simple biopsy. Furthermore, the necrotizing effects of the radium should begin promptly. In our opinion, the variability of the factors promoting tumor dissemination should be offset by the expected effectiveness of this method of interstitial radiation.

SUMMARY

Osteogenic sarcoma of the mandible is rare. Early diagnosis is possible because of its accessible anatomic position, provided various specialists in this "no man's land of surgery" recognize that osteogenic sarcoma is not hopeless if an aggressive approach is employed, both in suspecting its presence and treating it with this suggested combined form of therapy. Morbidity is minimal.

Mandibular osteogenic sarcomas, by virture of their anatomic position, should be studied separately in order that the effectiveness of similar forms of treatment can be better evaluated. These cases and any subsequent patients will be periodically reviewed and reported.

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Lymphangiosarcoma of the Lower Extremity Involved with Chronic Lymphedema

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ALTHOUGH there are many documented cases of lymphangiosarcoma of the upper extremity complicating elephantiasis chirurgica [1–4], only one case of lymphedema following surgery of the lower extremity is reported [5]. This was a case of Martorelli [5]; lymphedema developed in a forty-four year old woman after osteosynthesis for a fracture of the femur. The following case is believed to be the second.

CASE REPORT

The patient, a fifty-two year old white woman, was first treated elsewhere in 1944 for a squamous cell carcinoma of the cervix, stage II. She was treated by a combination of radiation consisting of a cervical cone and six external pelvic fields of 3,000 r total air dose and 3,600 milligram-hours of intracavitary radium. Subsequent examination revealed no residual cervical cancer.

In May 1953 pain developed in the patient's left hip. In July of that year a fracture of the neck of the left femur occurred. An open reduction was performed and a tumor involving the head and neck of the femur was encountered. Histologically this lesion was a fibrosarcoma. The head and neck of the femur were resected and a Judet prosthesis was inserted. Improvement was temporary and extensive edema of the upper thigh occurred. She was unable to walk. A mass measuring approximately 10 by 8 cm. appeared in the operative wound. Between December 17, 1953, and January 22, 1954, she received radiotherapy and a tissue dose of 3,840 r was administered. At the completion of the treatments the mass in the wound had become smaller and there was a decrease of the edema. Improvement was transient and on November 13, 1955, she fell sustaining a supracondylar fracture of the left femur. This was treated with a cast for eight weeks and a walking cast for an additional six weeks. The patient was relatively free of symptoms except for continuing lymphedema until approximately one and a half months before readmission on October 14, 1958. At that time she said that a "blister" developed on the mid-aspect of the thigh anteriorly, considerably below and isolated from the operative scar. Two weeks after the onset of this new lesion, it ruptured with considerable bleeding. There was a steady enlargement of the fungating, foul smelling mass which continued to bleed easily.

Physical examination on admission revealed an obese white woman with pulmonary edema and considerable pain in the lower extremity. Because of a severe flexion deformity of the left hip the patient was only able to sit. Motion of the left hip was limited and exceedingly painful. There was brawny induration of the left thigh to within 3 cm. of the knee and pitting edema of the lower leg. No evidence of residual cervical cancer was detected. Roentgenograms revealed a mixed osteolytic and osteoblastic lesion of the proximal left femur extending from the intertrochanteric region into the neck. These findings were felt to be compatible with the clinical impression of recurrent fungating fibrosarcoma. A biopsy was performed. Histological study of the tissue revealed a vascular soft tissue tumor rather than a spindle cell type of bone tumor. (Fig. 1.)

On October 23, 1958, a left hemipelvectomy was performed. The patient's postoperative course was stormy. A slough of the wound flaps occurred because of radiation damage and secondary infection. Pseudomonas aeruginosa was cultured from the wound and blood stream on several occasions. Her course was further complicated by gastric dilatation, atelectasis and cardiac failure. Despite all efforts her course was steadily downhill and she died on the fourteenth postoperative day. An autopsy was performed.

Gross Pathology. The hemipelvectomy specimen measured 93 cm. from heel to the superior line of resection. (Fig. 2.) There was a distinct brawny edema of the leg, the specimen measuring 53 cm. in circumference at a place 5 cm. above the knee joint. On the anteromedial aspect of the thigh, 5 cm. below the line of skin resection, an indurated, brown, depressed, 21 cm. linear surgical scar was present.

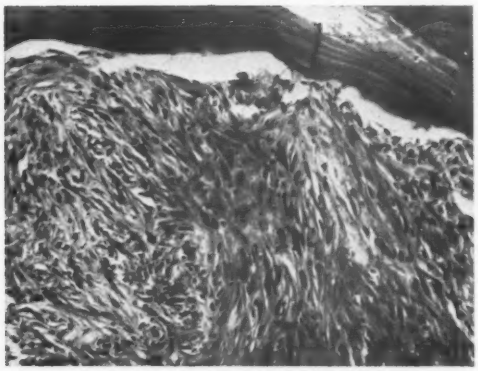

FIG. 1. Tumor of head of femur. Note the spindle cell and obvious malignant nature of this bony tumor.

This was oblique and followed the line of skin resection. No tumor was found in this area; however, the subcutis displayed a gray-white scar tissue for a distance of 2 cm. in depth. The tumor, measuring 7.5 cm. in diameter and 7 cm. in height, was situated distal to the scar and to the previously radiated areas. It was friable, brown-purple, malodorous, and extended into the subcutaneous fat 2 cm. in the greatest depth. The tumor did not extend to the muscle of the thigh and no communication with bone was detected. The cut surface of this tumor was firm, purple-red, and oozed blood. Numerous satellite, elevated lesions were found varying from 0.1 to 0.4 cm. in diameter. These smaller nodules were a more brilliant red in color and were scattered distal to the main tumor mass. Several smaller areas, appearing as purple-red macules, were present below the knee, the most distal located at a point 15 cm. below the knee joint in the mid-calf. The femoral artery and vein

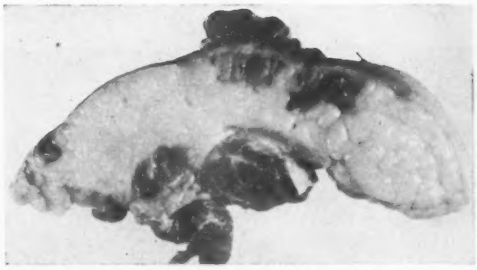

FIG. 2. Lymphangiosarcoma of thigh—hemipelvectomy specimen. Note the main fungating tumor extends into the subcutaneous fat. At the left a smaller lesion is seen. The calf contained even smaller isolated lesions.

and the saphenous vein contained fresh blood clots and were free of tumor. Femoral and obturator lymph nodes were free of tumor.

The femur contained a Judet prosthesis. The path of the stem in the femoral neck was surrounded by gray-white fibrous tissue with no focal areas of discoloration or softening. From the lesser trochanter inferiorly the femur was markedly osteoporotic with thin bony trabeculae and jelly-like purple marrow.

Microscopic Pathology. Microscopic examination of the soft tissues of the thigh revealed a marked amount of subcutaneous edema and lymphatic dilation. The tumor ran the gamut from lymphatic proliferation with atypical endothelial cellular ballooning to the typical Stewart-Treves [1] lesion of malignant tissue. Many portions of it were composed of solid sheets of epithelial-like cells with bizarre nuclei and somewhat vacuolated eosinophilic cytoplasm. (Figs. 3 and 4.) These regions merged with areas featuring definite channels lined with neoplastic cells. In these latter areas a definite lymphoid infiltration component was present, the

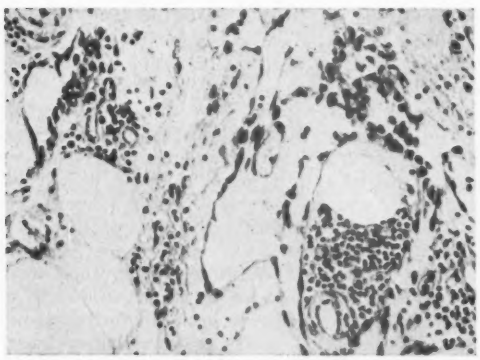

FIG. 3. Lymphangiosarcoma. The lymphoid component is particularly well seen. The malignant nature of such an area might be questioned if areas of more bizarre cytology were not seen.

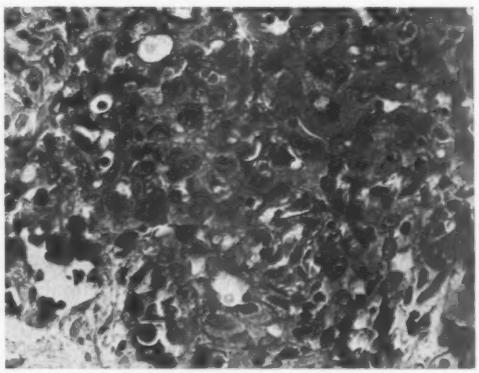

FIG. 4. Lymphangiosarcoma, more cellular area. Cells are vacuolated. Tubular formation is still evident in places.

lymphocytes being in both localized follicular and more diffuse distribution. In the more solid parts of the tumor a considerable amount of hemorrhage was noted, many of the neoplastic endothelial lined spaces being filled with blood and thus indistinguishable from blood vessel channels. The earlier lesions could be easily traced from dilated lymphatics.

Multiple sections of the tissue surrounding the stem of the Judet prosthesis showed a markedly dense collagenous replacement of the marrow without residual fibrosarcoma. The bone elsewhere showed marked osteoporosis and considerable hematopoetic activity. There were no lymph node metastases.

At autospy no tumor was found either local or metastatic. Death was due to bronchopneumonia and septicemia.

SUMMARY

This case represents the development of lymphangiosarcoma superimposed on postsurgical chronic lymphedema of the left lower extremity. The patient is unusual in the fact that there were three primary cancers, namely, of the cervix, proximal femur, and soft tissues of the thigh. The development of lymphangiosarcoma on the basis of chronic lymphedema in the lower extremity is uncommon.

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Persistent Carcinoma

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IT is well established that the rate of spread of many types of carcinoma may be extremely unpredictable. This fact has been demonstrated by papillary carcinoma of the thyroid which frequently acts like a benign disease. The patient may survive for many years despite the appearance of cervical metastases. Skin cancers may also grow slowly. A ten- to fifteen-year survival of patients with cancer of the breast is generally considered a good indication of cure. The purpose of this paper is to present case reports of long term follow-up study in two patients who had persistent or locally recurrent cancer over at least thirty years before dying of the original disease.

CASE REPORTS

CASE 1. Mrs. E. B., at the age of forty-five years, underwent simple mastectomy in 1928 for an adenocarcinoma of the right breast, followed by x-ray treatments. She had no further trouble until 1942, fourteen years after initial surgery.

Dr. E. P. Buchanan examined the patient in November 1942. She complained of ulceration and pruritus in the old operative scar of four months' duration. At this time, the original scar was excised. The specimen measured 10 cm. in length and 3 cm. in width. The pathologic report was, "persistent adenocarcinoma of the skin, subcutaneous tissue and pectoral muscles with ulceration and old x-ray burn."

The patient was well until October 1947 when she returned with a small ulcerating lesion just medial to the lower third of the scar. At two points in this area, there was evidence of metastatic carcinoma of the subcutaneous tissue. Local excision was again performed.

She was asymptomatic until July 1949 when she returned with another nodule measuring 1 cm. which lay to the right of the midline. This was again excised.

In November 1952 another local recurrence developed in two areas along the scar, each of which measured about 2 cm. in diameter. Wide excision was performed.

The patient was well for three years until November 1955 when I excised a 1.5 cm. malignant nodule from a point medial to the old operative scar. It was then twenty-seven years after the first operation had been performed, and the patient had received no x-ray therapy except for that following simple mastectomy. There was never any evidence of involvement of the axillary or superficial lymph nodes and during this time the patient appeared to be coexisting with the persistent cancer of the breast. However, the patient first showed signs of distant metastases in August 1957. This was twenty-nine years after her first operation. At that time hoarseness developed and the patient began to lose weight. A roentgenogram of the chest showed evidence of a large pleural effusion on the right side. Thoracentesis was performed on several occasions with the removal of 1,000 cc. of clear fluid, and finally radioactive phosphorus was instilled. (Fig. 1.)

She was readmitted to the hospital in November 1957 for increasing dyspnea, cough, anorexia and loss of weight. A recurrence of the pleural effusion on the right side was noted. Thoracentesis was performed, and 90 mg. of Thio-Tepa® was instilled in the pleural cavity.

The next admission was in April 1958 when she complained of weakness and loss of weight. Pleural tap with instillation of Thio-Tepa was repeated and she was discharged on cortisone. The only known metastases were intrathoracic.

Her progress thereafter was gradually downhill, and she died in September 1958 at the age of seventy-five years. This was thirty years after original mastectomy.

Comment. This case is presented because of the long period of time (thirty years) in which this patient lived with carcinoma of the breast before dying of the original disease. A total of five local excisions for recurrences on the chest wall were performed over a period of thirteen years.

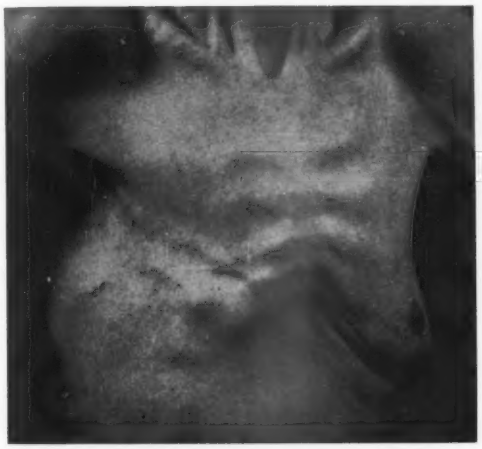

FIG. 1. Case 1. This demonstrates the operative site one year prior to the patient's death.

FIG. 2. Case 11. This demonstrates the appearance of scrotum and the ulceration in the old operative scar of left groin in January 1958, ten months prior to the patient's death.

CASE II. C. T. was a twenty-one year old man, in whom an itchy rash developed over the entire surface of the scrotum. His work at this time did not expose him to any chronic irritation. He was first treated with bichloride of mercury which did not alleviate the condition. Four months later he received x-ray treatments which resulted in complete disappearance of the rash. However, two years later (1923) he first noticed a pea-sized skin lesion involving the right side of the scrotum. This grew slowly with intermittent ulceration over a period of years. He received no definitive treatment until 1936, thirteen years after the initial discovery of the lesion.

Dr. E. P. Buchanan examined the patient for the first time in 1936. At this time a lesion measuring 5 by 4 by 1.5 cm. was excised from the right side of the scrotum. Primary closure and bilateral inguinal and femoral node resection were performed. The pathologic report was, "ulcerating epidermoid carcinoma of the skin of the scrotum and secondary carcinoma of right inguinal lymph nodes." No metastases were seen in the nodes on the left side.

He returned in November 1938 with a 2 cm. recurrence on the right side of the scrotum. Again a rather marked epidermoid reaction was noted over the entire right side of the scrotum and the skin of the penis on the dorsal surface near the base. Again the lesion was widely excised and the pathologic report was "epidermoid carcinoma of the skin of the scrotum with cornification."

The patient returned in August 1941 complaining of a burning ulceration of the scrotum. An ulcerating growth measuring 1 by 2.5 cm. was excised from the mid-portion of the anterior surface of the scrotum. A wide excision was made including the skin over an area 4 by 7 cm. in size. The pathologic report again was, "persistent cornifying squamous cell carcinoma of the left side of the scrotum."

He was not examined again until May 1955, fourteen years later. At this time he complained of a sore on the scrotum of two years duration. I then excised two small squamous cell carcinomas from the left side of the scrotum anteriorly. The carcinomas measured 1 and 1.5 cm. in diameter.

His next visit was in October 1956 when a small 0.6 cm. ulceration was excised from the anterior surface of the scrotum to the left of the shaft of the penis. The pathologic report was, "grade II squamous cell carcinoma" with a notation that the tumor was widely resected.

One year later the patient returned because of an unexplained intermittent swelling of the soft tissue of the penis. There was no evidence of any recurrence of carcinoma in the scrotum or the adjacent areas. It was not believed that this swelling was due to carcinoma, and he was referred to the Urology Department.

Two months later an ulceration developed in the left groin in the scar of the inguinal node dissection. Shortly afterwards the skin over the entire scrotum became red and weeping, but there was no definite evidence of carcinoma.

In December 1957 he was given a course of x-ray therapy to the ulceration in the left groin and the scrotum which resulted in complete healing. The penile swelling also subsided. (Fig. 2.)

In July 1958 an abscess developed in the old scar in the left groin. A month after this abscess had been drained another node dissection was performed on this side. The pathologic findings were metastatic squamous cell carcinoma and radiation fibrosis. This wound failed to heal and skin metastases developed in the wound edges. In addition,

painful lymphedema and thrombophlebitis of the leg developed which persisted until his death in November 1958. Death was apparently due to a pulmonary embolus. At this time no evidence of metastasis was noted outside of the left groin and genital areas.

Comment. This case is presented because it probably started in a rash when the patient was twenty-one years old. The effect of the x-ray therapy at that time is difficult to determine. It is interesting to note that the first operation was performed fifteen years after the initial appearance of the scrotal lesion and the lymph nodes on the right side revealed metastatic epidermoid carcinoma. Despite this, small carcinomas continued to develop on different areas of the scrotum. Finally, when the patient was fifty-eight years of age, thirty-seven years after the appearance of the original lesion, metastases to the groin developed in the side which had been normal twenty-two years before.

SUMMARY

Two case reports are presented of patients who lived for thirty years with persistent carcinoma before dying of the original disease.

Hemobilia: Massive Hemorrhage from the Common Bile Duct Due to a T Tube

REPORT OF A CASE AND REVIEW OF THE LITERATURE

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HEMORRHAGE into the bile ducts, or hemobilia, is a rare event but one which is now more frequently recognized. It has been reported in cases of trauma to the liver [*14*] or as occurring spontaneously [*6,8,11*]. In the latter cases it has often posed as a difficult problem in the differential diagnosis of gastrointestinal hemorrhage of obscure origin.

The purpose of this paper is to review the cases reported in the literature in which hemobilia could be attributed to a T tube in the common duct and to add an additional case recently encountered. A reasonably careful review of the literature revealed only nine such cases since the first report by Rabinovitch and Rabinovitch [*12*] in 1954.

REVIEW OF LITERATURE

The first report of massive bleeding from the common bile duct due to an indwelling T tube was published by Rabinovitch and Rabinovitch in 1954 [*12*]. They described two patients with intracholedochal hemorrhage, one of whom required operative intervention and ligation of a vessel in close proximity to the common duct. The bleeding in both cases was attributed to mechanical irritation of the mucosa of the common duct by the T tube. Both patients recovered.

Campbell [*1*] (1955) described a case of intracholedochal hemorrhage due to an indwelling No. 14 French catheter threaded through the common duct into the duodenum as a precautionary measure against damage to the common duct during gastric resection. The patient died after three repeated hemorrhages and at autopsy a small ulcer was found in the common duct with erosion into the posterior superior pancreaticoduodenal artery.

In the same year Leger and Afanassief [*7*] reported three cases of intracholedochal hemorrhage with one fatality. The underlying disease in all three patients was choledocholithiasis. The hemorrhage was single in two of the patients and multiple in the third one. All three patients had a febrile course prior to or coincident with the hemorrhage. Although ascending cholangitis is mentioned as a possible etiologic factor in the development of the hemorrhage, in two of the cases an associated disease could explain the temperature elevation.

Schroth [*13*] (1955) reported on a patient in whom a fatal hemorrhage into the common duct occurred on the twenty-first postoperative day after cholecystectomy and T tube drainage of the common duct. It is of interest that the bleeding occurred fourteen days after removal of the T tube. At autopsy the only significant finding was cholangitis. Schroth is not certain about the relationship of cholangitis to the pathogenesis of the hemorrhage but postulates that the bleeding probably resulted from extension of the cholangitis with resulting erosion of intrahepatic blood vessels.

Valls and Arrutti [*15*] (1956) reported on a patient with choledocholithiasis in whom massive hemorrhage from the T tube occurred on the twenty-sixth postoperative day with a fatal outcome. The patient was surgically explored but the only operative findings were blood clots in the common duct with no clue to the etiology of bleeding. No definitive surgical treatment was undertaken. The patient died

from blood loss despite multiple blood transfusions and permission for autopsy was not obtained.

Manfredi [9] (1958) reported a patient with choledocholithiasis in whom bleeding from the T-tube, hematemesis and melena occurred on the fifty-fifth postoperative day. The hemorrhage was fatal and an erosion of the wall of the hepatic artery by the T tube was found at autopsy.

Analysis of these cases (Table 1) shows that the first hemorrhage occurred between the fifth and fifty-fifth day after operation, with a mean of nineteen days. Age and sex played no role although most patients were in the fourth to seventh decades. The type of bleeding was bleeding from the T-tube in all cases except one in which the T tube was previously removed [13], hematemesis in one case [1] and hematemesis and melena in four cases [7,9,13, 15]. Fever was present in four cases [7,15] and jaundice was an associated finding in two cases [1,13]. Two of the nine patients had repeated hemorrhages, even after the T-tube was withdrawn [1,7]. Transampullary drainage was used in two cases, employing a long-arm T tube [7] and a No. 14 French catheter [1]. A short arm T-tube was used in the others. (In the cases in which the type of T tube used was not specified, it was assumed that a conventional short-arm T tube was used.) Treatment consisted of blood transfusion in every patient except two for whom no data were given [7], withdrawal of the T tube in three cases [12,15] and laparotomy in three cases [1,12,15]. In the patients who were surgically explored, the pathologic condition responsible for bleeding was found to be a superficial erosion of the mucosa of the common duct in one case [12], erosion of the posterior superior pancreaticoduodenal artery in another [1], and blood clots in the common duct in the third patient [15]. Surgical treatment consisted of ligation of a large vein in close proximity to the common duct [12] and suture ligature of the bleeding vessel [1]. In two cases in which autopsy was performed the underlying pathology was cholangitis [13] and erosion of the hepatic artery [9]. Five of the nine patients died, death apparently being from exsanguination [1,7,9,13,15]; in one case death was partly due to an associated disease [7]. The etiology of the choledochal bleeding was variously explained by the reporting authors as mechanical irritation from the indwelling T tube [12], anatomic relation of the common duct to the posterior superior pancreaticoduodenal artery [1], injury at operation, ascending cholangitis or mechanical erosion [7] and erosion of the hepatic artery [9].

The following case is the tenth one in this series and illustrates some of the problems encountered in hemobilia secondary to an indwelling T tube.

CASE REPORT

J. T. C., a forty-one year old white Naval aviator, was well until the morning of admission on February 23, 1959, when, after a breakfast of scrambled eggs, he developed severe epigastric and back pain without nausea, vomiting, dark urine or clay colored stools. There was no diarrhea or colicky pain.

Two years prior to admission he had a similar attack of pain with dark urine, clay colored stools and jaundice and was hospitalized for three weeks at another hospital. The jaundice persisted for about forty-eight hours and a gallbladder series during this admission was said to be negative. Following discharge from the hospital he was well except for an episode of upper abdominal pain without any associated symptoms and subsiding within a few hours without any therapy about two months prior to admission.

The past history was negative except for appendectomy at twelve years of age.

Physical examination revealed a well developed, husky man in obvious pain. The vital signs were normal. Pertinent physical findings were limited to the abdomen which was flat with marked tenderness along the right subcostal margin and over the liver area. There was no rebound tenderness and the bowel sounds were normal. No masses or organs were palpable.

Admission laboratory data showed the hemoglobin to be 15.5 gm. per cent, leukocyte count 8,800 per cu. mm. with a normal differential count, blood glucose 98.5 mg. per cent, serum amylase 63 units and a normal urinalysis including a negative test for bile and porphyrins. On admission roentgenograms of the chest and flat plate of the abdomen were interpreted as normal.

The patient was treated with nasogastric suction, intravenous fluids, sedation, and analgesics but continued to have intermittent episodes of severe pain which occurred spontaneously in the mid-back and both costal margins and radiated to right mid-epigastrium. There was no nausea, vomiting, fever or other constitutional symptoms. On the day after admission his serum bilirubin was 1.60 mg. per cent and two days later the patient's sclerae were noted to be icteric and he had a white

TABLE I

SUMMARY OF DATA IN CASES OF GASTROINTESTINAL HEMORRHAGE DUE TO INDWELLING T TUBE

Source of Data	Case No.	Age and Sex	Underlying Disease	No. of Hemorrhages	No. of Hemorrhages after Removal of T Tube	Type of Hemorrhage	Onset of Hemorrhage (postoperative day)	Removal of T Tube (postoperative day)	Type of T Tube Used	Fever	Jaundice	Treatment	Operative Findings in Patients Explored	Result	Autopsy
Rabinovitch and Rabinovitch [12]	1	41,M	Choledocholithiasis	1		Bleeding from T tube	10	10	Short-arm	Absent	Absent	Transfusion (500 ml.) and removal of T tube		Cured	
	2	46,F	Choledocholithiasis	1		Bleeding from T tube	23	23	Short-arm	Absent	Absent	Transfusion (1000 ml.), removal of T tube and laparotomy	Superficial erosion of mucosa of common duct	Cured	
Campbell [1]	3	63,M	Gastric resection for peptic ulcer	3	2	Bleeding from T tube Hematemesis	5	16	No. 14 French catheter from common duct to duodenum	Absent	Present	Transfusion (4000 ml.) and laparotomy	Ulcer in common duct with erosion of posterior superior pancreaticoduodenal artery	Died	See findings at operation
Leger and Afanassief [7]	4	70,F	Choledocholithiasis	1		Bleeding from T tube	20	34	Short-arm	Present	Absent	*		Cured	
	5	40,M	Choledocholithiasis	1		Bleeding from T tube	4	Died before removal of T tube	Long-arm	Present	Absent	*		Died (associated disease a contributing factor)	Not performed
	6	24,F	Choledocholithjasis	4	1	Bleeding from T tube Hematemesis, melena	7	29	Short-arm	Present	Absent	Transfusion and antibiotics		Cured	
Schroth [13]	7	51,F	Cholecystolithiasis	1		Hematemesis, melena	21	7	Short-arm	*	Present	Transfusion		Died	Common duct filled with bright red blood; cholangitis
Valls and Arrutti [16]	8	75,F	Choledocholithiasis	1		Bleeding from T tube Hematemesis, melena	26	26	*	Present	*	Transfusion, removal of T tube and laparotomy	Blood clots in common duct	Died	Not performed
Manfredi [9]	9	74,M	Choledocholithiasis	1		Bleeding from T tube Hematemesis, melena	55	Died before removal of T tube	*	Absent	Absent	Transfusion		Died	Erosion of hepatic artery by T tube

* Not listed.

stool. Serum bilirubin at this time was 7.0 mg. per cent, serum amylase was 160 units, and serum glutamic oxaloacetic transaminase 176 units.

With a preoperative diagnosis of a stone in the common duct the patient was taken to the operating room and a laparotomy was performed through an upper right rectus incision. On opening the abdomen the gallbladder was found to be markedly distended but not acutely or chronically inflamed. The common duct was dilated and measured approximately 14 mm. in diameter. No calculi could be palpated in the gallbladder or the common duct. Thorough exploration of the abdomen failed to reveal any other pathology. A cholecystectomy was then performed. The gallbladder was opened and found to contain thick green bile but there were no stones present. Next, the common duct was explored. A large amount of thick, very dark bile came out of the common duct under a considerable amount of pressure. In this bile were many gravel-like calculi measuring 1 to 2 mm. in diameter which were evacuated with a stone forceps and the ducts were then irrigated with sterile saline. Graduated Bakes dilators were then passed through the sphincter of Oddi into the duodenum without encountering any obstruction. A T tube of the long-arm type was then placed into the common duct with the distal arm passing through the sphincter of Oddi into the duodenum. The abdomen was then closed, leaving a drain in the foramen of Winslow.

The immediate postoperative course was uneventful with rapid clearing of jaundice. The T tube drained 60 to 90 cc. of brown-yellow bile every twenty-four hours during the first four postoperative days. On the fifth postoperative day the drainage from the T tube increased to 500 cc. The patient was noted to have a daily temperature elevation of 100°F. to 101°F. There were no localizing signs of infection. The hemogram at this time showed the hemoglobin to be 15.5 gm. per cent, leukocytes 10,800 per cu. mm. with a slight shift to the left, and the urinalysis was negative. Roentgenograms of the chest showed disc atelectasis in the right mid-lung field. The sutures and drain were removed on the seventh postoperative day and the wound appeared to be well healed. The drainage from the T tube remained at 500 to 700 cc. every twenty-four hours and the low grade fever continued. On the ninth postoperative day the patient had two large liquid stools which appeared to be mostly dark red blood and gave a 4 plus guaiac test. Similar dark red, guaiac positive fluid was escaping from the T tube. The patient felt weak and dizzy immediately after the bowel movements and showed signs of early vascular collapse. Hemoglobin done at this time showed a drop to 12.8 gm. The patient was given a blood transfusion of 500 ml. of whole blood with rapid relief of symptoms and return of blood pressure and pulse to normal. The bleeding from the T tube also rapidly subsided although small dark red and black clots could be irrigated from the T tube in the next twenty-four hours. The volume of bile decreased to 250 to 500 cc. every twenty-four hours in the subsequent two days when the T tube was clamped. The patient had a tarry stool on the tenth postoperative day and subsequently all of his stools were normal. A cholangiogram through the T tube obtained on the thirteenth postoperative day showed no obstruction to the flow of bile and the T tube was removed on the fourteenth day with the patient asymptomatic and feeling well. The stab wound from the previous T tube site closed rapidly and the patient was discharged on the sixteenth postoperative day.

Follow-up examination two months later showed that the patient has had no recurrence of bleeding or other symptoms and has returned to full duty as a pilot.

COMMENTS

The mortality in choledochostomy is now essentially as low as that associated with an uncomplicated cholecystectomy. Indications for exploration and intubation of the common duct are well known and when carefully performed are accompanied by little risk to the patient. The hazards associated with choledochostomy were recently reviewed by Fredell and Mithoefer [5].

The patient reported here is unusual on two accounts. First, he had choledocholithiasis without an associated cholecystolithiasis. This has been said to occur in 4 to 6 per cent of cases with cholelithiasis [3,16]. Second, he had massive intracholedochal hemorrhage associated with melena secondary to an indwelling long-arm T tube. The single bleeding episode occurred on the ninth postoperative day. Although positive proof that the intracholedochal hemorrhage was caused by the T tube is lacking in this case, as it was in the other cases reported in the literature in which surgical exploration or autopsy were not performed, it may be, nevertheless, considered definite by absence of other pathologic conditions which might have been responsible for the bleeding.

The physiologic consequences of hemorrhage into the biliary tract, so called hemobilia, are twofold [1]: (1) hemorrhage in general, manifested by tachycardia, prostration and shock, and (2) effects of biliary duct obstruction, partial or complete. This is usually of short duration as blood mixed with bile shows little

tendency to clot [4], but may be sufficient to produce pain typical of biliary colic and jaundice [1].

A striking feature of the incidence of choledochal bleeding secondary to an indwelling T tube is the rarity with which it occurs [12]. Although minor bleeding from the T tube is probably not uncommon, a major hemorrhage is decidedly rare. The possible etiologic factors which could be responsible for the bleeding will be discussed under three headings.

Traumatic Injury to the Bile Ducts and Blood Vessels. Trauma to the common bile duct and adjacent blood vessels at operation for the primary disease has been implicated as a possible etiologic factor in the development of postoperative hemobilia [7]. Although it may play an important role in a given case, operative trauma in most of the reported cases can be excluded as a significant cause of hemobilia because of the rather long interval between operation and the onset of bleeding.

Cholangitis. Ascending cholangitis has been suspected as a predisposing factor in the etiology of hemobilia in at least two cases [7] and as a main factor in another case [13]. We also found a case report in which marked cholangitis extending throughout all the radicles of the biliary system eroded into a branch of the portal vein within the liver and produced a fatal hemorrhage [2]. No other reports to this effect could be found, however. It is possible that ascending cholangitis could also have been the underlying cause of the febrile course prior to the intracholedochal hemorrhage in our case, but the associated pulmonary atelectasis alone appears adequate to explain the temperature elevation. Thus, although cholangitis *per se* probably can cause massive hemorrhage, this occurrence is distinctly uncommon. Despite the negative evidence, ascending cholangitis cannot be excluded as an important contributing factor in the development of the hemorrhage. Infection with its associated congestion and increased friability of the mucosa of the bile ducts may predispose to erosion and ulceration of the mucosa by the T tube. A massive hemorrhage will result if the ulcer erodes into a large enough blood vessel. This will be discussed under the next heading.

Anatomic Relationship of the Common Duct to the Pancreaticoduodenal Arteries. The anatomic relationship of the distal common duct to the pancreaticoduodenal arteries and the pancreas was stressed by Campbell [1] and appears to be the most satisfactory explanation of the intracholedochal hemorrhage in the majority of the cases under consideration.

Anatomically, the common bile duct can be divided into an upper portion which is embedded in loose areolar tissue of the hepatoduodenal ligament and a lower portion which is embedded firmly in the pancreas and is in intimate relationship to the pancreaticoduodenal arteries [10]. This is depicted in Figure 1. There are two arterial arcades which supply the duodenum and the head of the pancreas. The *anterior arcade* consists of the anterior superior and inferior pancreaticoduodenal arteries, and the *posterior arcade* is formed by the posterior superior pancreaticoduodenal artery (retroduodenal artery), a branch of the gastroduodenal artery, and the posterior inferior pancreaticoduodenal artery arising from the superior mesenteric system. The intimate relationship of the distal common duct to the posterior superior pancreaticoduodenal artery is obvious. The artery crosses the common duct first anteriorly and then posteriorly before it forms an anastomosis with the posterior inferior pancreaticoduodenal artery to complete the posterior arcade. This relationship has been said to occur in over 90 per cent of cases [17]. The constant *prepancreatic arterial arcade* which arises from the anterior arcade and is in close contact with the common duct anteriorly can also be seen in the diagram.

An increase in the intraductal pressure in the distal common duct (such as may be caused from an indwelling T tube) will be directly transmitted to the surrounding nonyielding structures, namely the neighboring blood vessels and the pancreas, as the cushioning effect of the areolar tissue such as is present around the upper portion of the common duct is absent. If an ulceration of the mucosa of the common duct is produced, an extension of the ulceration into a blood vessel will result in massive hemorrhage into the common duct. Intubation of the upper common duct would appear to be attended with a lesser risk because of the absence of arteries intimately associated with the common duct in addition to the presence of areolar tissue around it; this areolar tissue can buffer the pressures applied to the common duct, thus preventing their direct transmission to neighboring important structures, especially the

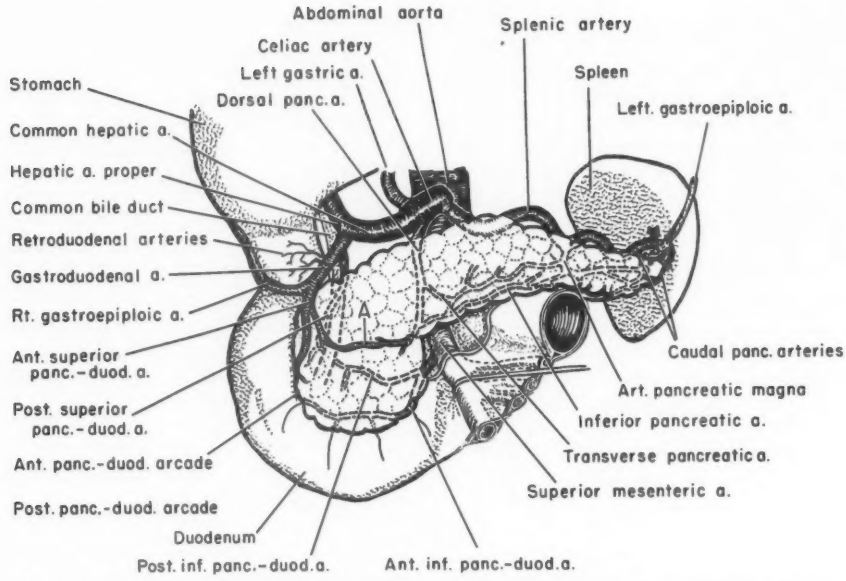

FIG. 1. Relationship of the pancreaticoduodenal arteries to the distal end of the common duct. "A" designates the prepancreatic arterial arcade. (From: Woodburne, R. T. and Olsen, L. L. The arteries of the pancreas. *Anat. Rec.*, 111: 255, 1951.)

hepatic artery. Ulceration of the mucosa of the upper common duct and extension of the ulceration into the hepatic artery can, however, also occur [9]. This occurrence is undoubtedly anatomic location. An anomalous location of the artery, which would bring it into a more intimate relation to the common duct, might make this occurrence more frequent. Perhaps the intracholedochal hemorrhage in some of the reported cases could be explained on the basis of such anomalous blood supply.

Treatment in the reviewed cases generally consisted of transfusion of whole blood and, in nonresponsive cases, of laparotomy. The use of antibiotics is mentioned in only one report [7]. It should be noted that although removal of the T tube was advocated as an initial treatment of the bleeding episode [12], the removal of the T tube is neither a guarantee that the bleeding will stop nor that it will not recur. In addition, if obstruction of the common duct by blood clots should occur, the T tube will be needed more than ever. Thus a reasonable method of treatment appears to be blood transfusion, and, if no response is obtained, laparotomy and ligation of the offending vessel or bleeding point if one can be found. Antibiotics should be used if there is evidence of biliary tract infection.

An even more important aspect of treatment is prevention. Intubation of the common duct, especially in its distal portion, should be avoided unless a definite indication for it is present. If transpullary biliary drainage is employed, the surgeon should be well aware of the possible hazards which may attend it.

SUMMARY

A rare cause of hemobilia may be mechanical erosion of the common bile duct due to an indwelling T tube.

The etiologic basis for the bleeding in most cases is the intimate relation of the distal common duct to the posterior superior pancreaticoduodenal artery and the prepancreatic arterial arcade.

The role of ascending cholangitis remains uncertain but may be an important predisposing factor in the development of hemorrhage.

Nine cases of massive intracholedochal hemorrhage were collected from the literature and a tenth case is added. The mortality of the reported cases has been 50 per cent.

The most rational treatment of the bleeding

episode appears to be transfusion of whole blood and in nonresponsive cases laparotomy with ligation of the bleeding vessel. Antibiotics should be used if there is evidence of ascending cholangitis. By way of prevention, intubation of the common duct should be avoided unless a definite indication is present.

Acknowledgment: We are indebted to Dr. E. Teagle for his help in the translation of the foreign literature.

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Perforated Adenocarcinoma of the Appendix

A REPORT OF TWO CASES

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RECENT interest in this rare entity has led to a review of the literature by Brown and Husni. Only fifty-three cases of proved perforated primary carcinoma of the appendix have been previously reported. Because of the rarity of this disease it should not be given prime consideration in the differential diagnosis of tenderness in the right lower quadrant, but the possibility should be entertained especially in the elderly patient. Technically, a malignant lesion in this area should be removed easily if it is found in the early stage and in such instances the prognosis is good. Frequently, however, there may be a late manifestation with perforation as illustrated by the following cases. Because of limited follow-up in the cases reported to date, it is impossible to give definitely a relatively good or bad prognosis in this rare pathologic entity.

CASE REPORTS

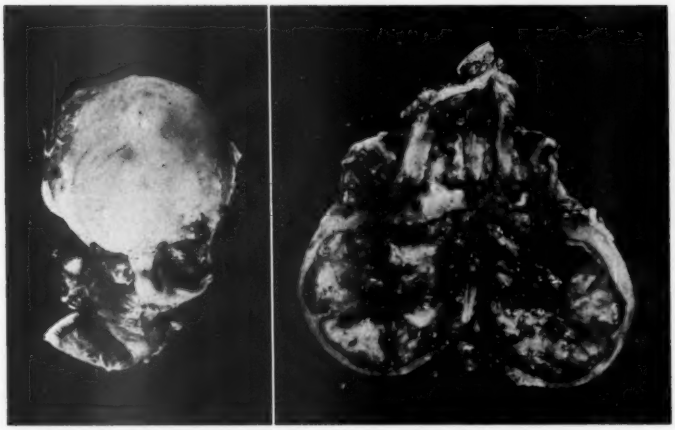
CASE I. E. C., a thirty-six year old white man, was admitted on January 19, 1954, with dull, nonradiating abdominal pain in the right lower quadrant of three days' duration. He had had progressive multiple sclerosis for ten years. Physical examination revealed a thin Caucasian man with temperature of 99.2°F., moderate tenderness in right lower quadrant and a definite cystic mass in the region of the cecum. Neurologic and eye examinations were compatible with multiple sclerosis.

Laboratory data revealed a hemoglobin of 15.8 gm. per cent white blood cells, 10,800 per cu. mm., with 69 per cent neutrophils and 29 per cent lymphocytes. Urinalysis showed 1-plus albumin and 10 to 12 white blood cells per high power field. A scout film of the abdomen and routine chest film revealed no abnormalities. A preoperative diagnosis of a walled-off inflammatory mass was made. The patient was taken to the operating room on January 20, where, on opening the peritoneal cavity, a large amount of mucinous material spilled into the wound from a 1 cm. perforation in a 5 cm. firm mass located at the tip of a retrocecal appendix. Frozen sections of the gelatinous material showed malignancy. Since the proximal two-thirds of the appendix, the cecum and ileocecal junction appeared to be normal, the egg-shaped mass (Fig. 1A and B) was removed in a retrograde fashion. The right gutter and serosal surface of the ascending colon were covered with this mucinous material necessitating the placement of a cigarette type drain through a stab wound. There was an uneventful postoperative recovery and the patient was seen routinely by the Surgical Tumor Board.

The pathologist reported mucocele (Fig. 2) with extension through the muscularis. A barium enema taken October 17, 1955, because of lower abdominal pain and constipation was within normal limits. The patient was readmitted on May 20, 1956, in shock with a three weeks' history of progressive pitting edema of the lower extremities, increased weakness, pain and weight loss. Supportive therapy was instituted on the comatose patient who subsequently died on May 22. Autopsy confirmed the diagnosis of multiple sclerosis and revealed widespread serous seeding, intestinal and cystic duct obstruction with metastases to bone marrow secondary to the previously resected neoplasm.

Comment: This represents a two-year survival following the initial perforation despite unfavorable circumstances. This may be explained possibly by the age of the patient and the natural history of this type of malignancy.

CASE II. P. B., a seventy-one year old white man, entered the hospital on August 26, 1949, with a ten-day history of nausea, intermittent vomiting, diarrhea and constant general abdominal pain. Past history was non-contributory except that the patient had required digitalization for congestive



1A 1B

FIG. 1. CASE I. A, the specimen consists of a vermiform appendix, measuring 8.2 cm. in length. The distal two-thirds contains a soft fluctuant, cystic area, 3.7 cm. in diameter. B, cut section of the cyst reveals this to be filled with a red-yellow gelatinous mixture.

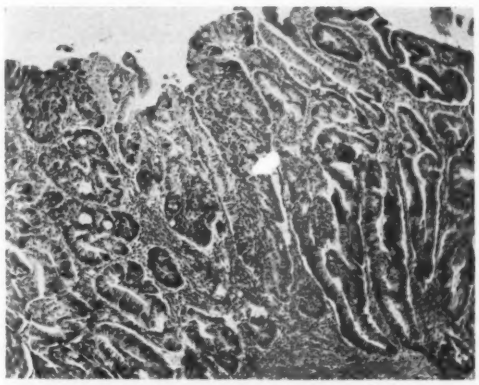


FIG. 2. CASE I. Photomicrograph of the appendix showing adenocarcinoma of the mucin-secreting variety with extension of the neoplasm through the muscularis.

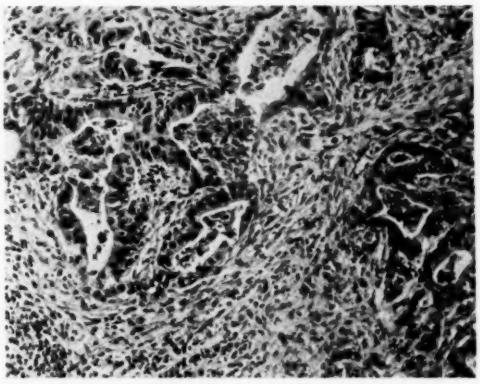


FIG. 3. CASE II. Photomicrograph of the appendix showing adenocarcinoma.

heart failure secondary to arteriosclerotic heart disease six months prior to this admission.

Physical examination revealed a poorly nourished, emphysematous, aged man with rales at both bases and a temperature of 101°F. There was moderate cardiomegaly with a harsh, grade 3 apical systolic murmur transmitted to the left axilla. Both lower quadrants were tender with associated voluntary rigidity. No pedal edema was noted. There was grade 2 benign prostatic hypertrophy. Laboratory data revealed a hemoglobin of 90 per cent; white blood cells, 26,800 per cu. mm., with 97 per cent neutrophils, 5 per cent lymphocytes and 2 per cent monocytes. Urinalysis and x-ray films of the abdomen were within normal limits. Chest plate and electrocardiogram were within normal limits. Blood urea nitrogen was 14 mm. per cent.

On admission the patient's temperature was 101°F. and rose to 102°F. for the subsequent two days with reversion to normal spontaneously. Definite tenderness in the right lower quadrant and involuntary rigidity developed on August 29. A mass could be felt on the right side with right-sided tenderness on rectal examination. On August 31, the patient was taken to the operating room and a large abscess cavity was found adjacent to the cecum and drained. Postoperatively the patient did well except for severe urinary retention. Follow-

TABLE I
SUMMARY OF THE COMMON CLINICAL FINDINGS OF THE FIFTY-FIVE REPORTED CASES

Acute or subacute appendicitis	34
Palpable mass in right lower quadrant	12
Recurrent or intermittent pain	7
Uterine or ovarian pelvic disease	5
Other signs or symptoms, i.e., gallbladder, etc	2

TABLE II
THE MOST COMMON SURGICAL FINDINGS ENCOUNTERED AT TIME OF OPERATION

Ruptured appendix with abscess	22
Local or distant metastases	10
Found incidental by removal of appendix	7
Mucocele found	5

ing cystoscopy and an intravenous pyelogram, transurethral resection was performed on November 8, without sequelae. Barium enema on October 25, revealed a fistula communicating with the cecum or small bowel. Following an oral sulfasuxidine bowel preparation the patient was taken to the operating room on December 20, for excision of the right lower quadrant sinus tract. Right hemicolectomy, terminal ileectomy and ileocolostomy were performed for an adenocarcinoma (Fig. 3) involving only the middle of the appendix. A large retroperitoneal abscess cavity was found but could not be excised *in toto*. On December 23, 1949, the patient suddenly died of an acute myocardial infarction. At autopsy no evidence of metastases was found.

Comment: This case represents a perforation in which the prognosis could have been excellent if the patient had not died from an unrelated myocardial infarction.

COMMENTS

Certainly primary perforative adenocarcinoma of the appendix can be classified as a rare lesion since previously reported cases plus these two make a total of fifty-five to date. A compilation of the pertinent clinical facets is presented in Table I. Over one-half (60 per cent) of these patients present with acute appendicitis. These reported cases illustrate two different clinical syndromes which may be found: (1) acute appendicitis; and (2) abdominal mass with pseudomyxoma mucocele formation.

Even though carcinoma of the appendix, if found early, represents a favorable surgical cure, a method of early diagnosis remains remote. Frozen section should be performed on all who have a suspicious surgical lesion.

Some conclusions can be drawn from these cases. The common finding is that of acute appendicitis. (Table I.) Although a malignant mucocele can occur it is not the most common surgical finding. (Table II.) If an elderly patient presents with an acute abdominal mass, large bowel carcinoma, appendicitis, ovarian mass, perforated appendix or diverticulitis should not constitute the only considerations. Removal of the large and small bowel with node dissection is the procedure of choice if the tumor appears to be localized in the area of appendix.

CONCLUSIONS

1. Early diagnosis of appendiceal carcinoma is difficult and for this reason the prognosis remains poor.

2. Most commonly, adenocarcinoma presents as an acute appendicitis which frequently ruptures with abscess formation.

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Hypothermia and Hypotension for Intracranial Surgery during Pregnancy

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WITHIN recent years the surgical treatment of intracranial vascular lesions has been significantly enhanced by the use of systemic hypotension or hypothermia, or by a combination of these. Intracranial vascular problems are not uncommon during pregnancy. In planning the operative treatment the fate of the fetus as well as that of the mother must command attention. We have had recent occasion to use hypotension and hypothermia, respectively, in the course of surgical treatment of a vascular intracranial problem in each of two pregnant young women. The fetus was lost in the patient in whom hypotension was employed to help control bleeding. The patient in whom hypothermia was used has since delivered a normal child at full term after an otherwise uneventful pregnancy.

CASE REPORTS

CASE I. An eighteen year old white woman, primipara, in the thirty-fourth week of gestation was admitted with symptoms of blurred vision that had been present for two weeks. She also complained of generalized headache that had progressed in intensity and frequency since the beginning of pregnancy. The results of previous prenatal examinations and laboratory studies were reported to be within normal limits. She had gained 15 pounds and the fetal movements were regular. The results of physical examination were compatible with a normal pregnancy of eight months' duration except that severe bilateral papilledema, enlarged blind spots and diminished visual acuity were noted. Localizing neurologic signs could not be detected. The patient complained of excruciating headache, intermittent nausea and vomiting. The obstetric consultant recommended that diagnostic tests and surgical treatment indicated for the intracranial lesion should be performed; it was believed that the fetus should be protected as much as possible, but the primary concern was to treat the mother.

After ventriculography a right frontotemporoparietal craniotomy was performed which revealed an extremely vascular neoplasm that occupied most of the middle fossa and was attached to the dura mater of the temporal region. Frozen sections revealed an anaplastic meningioma. Excessive bleeding was encountered during the operation and deliberate hypotension was induced. An 0.1 per cent solution of arfonad was given intravenously; the total amount administered was 1.1 gm. during a four-hour period.

The systolic cuff blood pressure was maintained below 80 mm. Hg for one period of ninety minutes and a second period of thirty minutes, with specific levels recorded as low as 50/30 and 35/20 mm. Hg, although the latter were immediately remedied by the use of a vasopressor. Extensive loss of blood occurred which required a transfusion of 2,000 cc. of whole blood. The procedure was terminated after 150 gm. of the tumor had been removed.

Fetal heart tones could be heard until four hours after completion of the operation. Nine hours postoperatively the patient went into spontaneous labor and vaginally delivered an unmacerated stillborn fetus weighing 3,000 gm. The mother's condition improved satisfactorily. Radiation therapy was given to the area of remaining tumor, but overwhelming recurrence and neoplastic meningitis developed. The patient died seven months following operation.

CASE II. A seventeen year old white woman, primipara, in the seventeenth week of gestation was admitted with a history of subarachnoid hemorrhage four days previously. She had complained of sudden, severe, right-sided headache which was followed by unconsciousness, complete flaccid left hemiplegia and incontinence. The spinal fluid was bloody and under increased pressure. The patient improved somewhat and was in a semi-comatose state at the time of admission, but the left hemiplegia, hemihypesthesia, hyper-reflexia and congruous left lower homonymous hemianopia persisted.

Bilateral carotid angiography showed an arteriovenous malformation, measuring 2 cm. in diameter, lying in the right sylvian fissure about 6 cm. distal to the bifurcation of the right internal carotid artery.

During the operative procedure hypothermia was induced by surface cooling in an ice bath. Preoperative medication consisted of promethazine hydrochloride 0.045 gm., meperidine hydrochloride 0.075 gm. and atropine sulfate 0.0003 gm. intramuscularly. The patient's blood pressure was 110/60 mm. Hg initially, 130/70 mm. Hg during the cooling period, 100/50 mm. Hg during the preoperative procedure and 120/60 mm. Hg upon rewarming. Through a right frontoparietal craniotomy the area of abnormal vessels was identified. With the body temperature at 30°C., a Mayfield arterial clip was applied to the main trunk of the middle cerebral artery for fifteen minutes; the vascular malformation was removed *en bloc*. The patient's postoperative course was uneventful. She had a spontaneous vaginal delivery in the thirty-fifth week of gestation. The baby was a normal male who weighed 6 pounds 6 ounces. During the six-month follow-up examination the patient showed mild weakness and distinct cortical sensory loss on the left side of the body. She has been able to take care of the baby who showed normal development.

COMMENTS

No other reports were found in the literature concerning the use of induced hypothermia for intracranial surgery during pregnancy. Boatman et al. [*1*] reported on a patient pregnant for ten weeks who had a post-traumatic aneurysm of the internal carotid artery in the neck. The aneurysm was repaired with the patient under hypothermia. Rowbotham et al. [*2*] used hypothermia (30° to 34°C.) for seven days in a woman pregnant for eight weeks who had had a severe head injury. The patient gradually improved and gave birth at full term to a normal infant. A number of reports have mentioned the use of hypothermia or hypotensive agents to treat the toxemias of pregnancy [*3,4*].

In the first case reported herein surgical treatment of the malignant neoplasm was imperative. It is probable that the profound arterial hypotension was the cause of fetal death. In contrast the second case presented the less complex problem of a vascular lesion in the sylvian fissure of the dominant hemisphere. The mother and the fetus appeared to tolerate hypothermia without difficulty.

CONCLUSIONS

On the basis of the two cases reported herein it would appear that the use of hypotensive agents during craniotomy on a pregnant patient carries a considerable risk to the fetus. On the other hand systemic hypothermia under similar circumstances appears to be well tolerated by the fetus.

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Impending Volkmann's Ischemia

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VOLKMANN'S ischemia is a serious complication of supracondylar fractures of the elbow which, if not promptly recognized and treated, can lead to permanent impairment and contracture of the hand. Fortunately, most patients with vascular impairment associated with supracondylar fractures respond to the removal of constricting plasters or bandages, to traction, and other measures outlined in the present article under treatment. The following case is being reported because the patient did not respond to the usual routine measures, and surgery on the artery was necessary to relieve the ischemia. The rarity of such a case was recently pointed out at a meeting of the Committee on Trauma of the American College of Surgeons.* Dr. Fred Smith of New York Presbyterian Hospital reported that in a large series of supracondylar fractures over many years, no patient had required surgery to restore the circulation.

Since release of external constriction so frequently relieves ischemia, it has been assumed that this is the sole cause of this condition. This assumption goes back to the original description by Volkmann of ischemic contractures, in which he ascribed this condition to tight bandages and plasters. This has caused some unfortunate embarrassment for physicians who were blamed for the development of this complication. Although the prompt removal of all restricting bandages and plasters is a must, there can be no doubt anymore that many cases of Volkmann's contracture have originated without any external constriction. Some cases have even been observed on the uninjured leg while both legs were treated with traction for fracture of the femur [*1*]. Leriche and his coworkers [*2,3*] have shown the important role of a local vasoconstrictor reflex within the injured artery, and have practiced arterectomy. Such a local reflex could explain failures to restore collateral circulation by sympathetic nerve blocks alone.

Following fracture or injury, the onset may be acute within hours, or insidious within days. The main warnings are the "four P's": pain, pallor, pulselessness and paralysis. Other symptoms are swelling, coldness, cyanosis and inability to extend the fingers. It is important to remember that pain may be absent, sometimes due to simultaneous nerve injuries or to nerve ischemia [*4*].

PATHOLOGY

Despite all the progress medicine has made in this condition, the real cause for shrinkage of a dead muscle, which causes this deformity, is still an unsolved mystery [*5*]. Histologic sections from ischemic muscles show the appearance of degenerative changes (cross striations and Bowman's disk) a few hours after the onset of ischemia. Stasis and silting in arterioles and capillaries, according to Clark, are the causes of these muscle changes, rather than persistent arterial spasm or venous congestion [*6*].

According to some authors (Brooks et al. [*7*] and Hart [*8*]), the disturbance of venous return, rather than arterial spasm, is responsible for muscle damage. However, most investigators found that the arterial impairment dominates the picture [*5*].

TREATMENT

Treatment consists first of removal of all constricting bandages and plasters, elevation with or without skeletal traction, and decreasing flexion of elbow until circulation returns. Achievement and maintenance of a satisfactory reduction may in some cases be therapeutic, in other cases must wait until other measures achieve restoration of circulation. Sympathetic

* Tri-City Meeting of the Trauma Committee on April 24, 1959, Boston, Massachusetts.

nerve blocking and high spinal anesthesia in the case of involvement of the lower extremities are of value [1].

If conservative means are of no avail, no time should be lost before surgical exploration. In involvement of the upper extremities, the antecubital area is explored. Investigation of the brachial artery and involved nerves is preferable to fascial splitting only. The contracted artery may respond to irrigation with warm saline solution, Novocaine® and gentle massage, periarterial stripping, or removal of a considerable length of artery. According to Leriche, by excising the injured part of the artery, the "triggerpoint" constricting the collateral circulation is presumably removed [2,3].

A less known method to overcome arterial spasm is the dilatation of the artery with saline infusions [9].

By these various measures and especially by early operation, a good number of patients with brachial vasospasm can be saved from having a crippled hand due to Volkmann's ischemia [2,3]. The severance of continuity of an essentially intact artery however, should be reserved as the last resort. Since there is still no complete uniformity as to the role the venous circulation plays in relation to the arterial circulation, the question whether the vein should also be ligated together with the artery remains a moot one.

CASE REPORT

The following case afforded a good opportunity for differential diagnosis and choice of treatment.

A seven year old boy was admitted to the hospital on July 4, 1954, after having fallen, landing on the left elbow. The left elbow was painful and swollen. There was deformity and loss of function. Roentgenograms showed posterior dislocation of the left elbow with supracondylar fracture and marked overriding of the distal fragment. (Fig. 1.) The fracture was reduced the same day with the patient under general anesthesia, and the elbow was immobilized in 90 degrees of flexion. Circulation of the fingers was good.

Postreduction roentgenograms showed complete reduction of the dislocation and excellent apposition of the fracture in the anteroposterior view. Fragments in the lateral view, however, revealed 90 degrees internal rotation of the distal fragment. The next night the hand became cold and the nail beds cyanotic.

The plaster was bivalved and check roentgenograms showed no change in position. The radial pulse was absent but returned for a short time when the elbow was extended to 140 degrees, then disappeared again. Because of the circulatory embarrassment the patient was transferred to my care the same day.

Since it was likely that the 90 degrees rotational deformity had contributed to the circulatory disturbance by twisting the artery, this rotation was corrected by gentle manipulation and an anatomic position was obtained under fluoroscopic control. This position was essentially maintained by Kirschner wires transfixing the medial and lateral condyles to the distal humeral shaft with the elbow extended to 140 degrees. (Fig. 2.) However, the radial pulse, which had returned for a short time following manipulation, disappeared again. It came back strongly after several hours but faded out slowly to disappear completely again at night.

More often than not the differential diagnosis between complete severance of the artery, thrombosis and vasospasm cannot be made preoperatively. This case, presenting the unusual feature of alternating periods of complete obliteration of the radial pulse with intervals of full recovery, provided a diagnostic clue. It excluded causes which permanently and completely prevent the blood flow through the vessel such as complete severance or thrombosis of the artery. Therefore, vasospasm or mechanical compression by hematoma, edema, or the fragments was the most probable preoperative diagnosis.

Because of impending Volkmann's ischemia it was decided to explore the brachial artery. While the patient was being prepared for exploration, several stellate ganglion blocks were given by the anesthetist. The blocks did not restore pulsation of the radial artery. However, they increased the skin temperature above that on the normal side.

With the patient under general anesthesia an incision measuring 3 inches was made over the center of the elbow joint, according to the Fiolle-Dalmas method [10]. The incision went along the medial aspect of the biceps and only the skin was incised. The superficial and deep fascias were carefully opened with blunt pointed scissors. The subcutaneous tissue, fascia and muscles were discolored from the blood, making identification difficult. The lacertus fibrosus was undermined with a mosquito clamp, cut and retracted with an Allis clamp. A big median nerve was encountered in its normal position but the brachial artery and its bifurcation were entirely hidden. No pulsation could be felt in the elbow region. The medial and lateral sides of the median nerve were explored by dull dissection but still the brachial artery was not visible. The incision was slightly enlarged into the upper arm and a faint pulsation could be felt with the finger on the medial aspect of the biceps. This pulsa-

FIG. 1. Stereogram of the supracondylar fracture of the elbow before reduction.

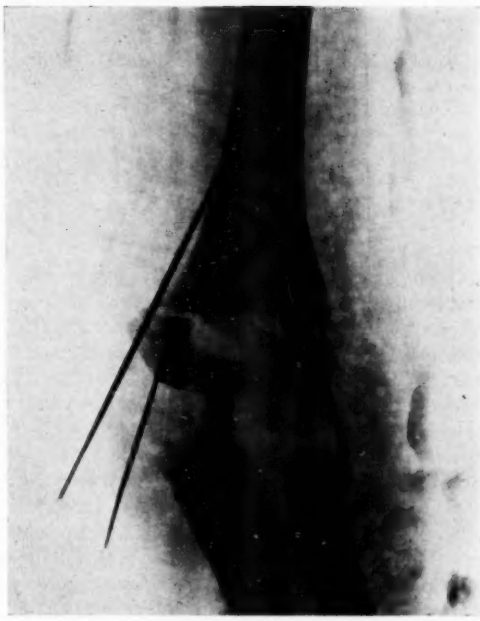

FIG. 2. Anteroposterior view following final reduction and transfixation with Kirschner wires and plaster.

tion could not be traced down to the elbow region or the forearm. The exploration was then directed behind the median nerve. A small concomitant vein was encountered and behind this vein another vessel was exposed. The identification of this vessel was difficult at first since no pulsation was found and no blood flowed through it. This vessel was, in the course of further dissection, definitely identified as the brachial artery. When seen at first it was hard to believe that this pale structure of the diameter of a 19 gauge needle could represent the brachial artery. A small adhesion across the artery was noted and removed. Rinsing with warm saline solution and xylocaine had no affect on the size of the vessel and did not restore pulsation. The adventitia was stripped from 1½ inches of the vessel wall. It was only then that a faint pulsation became palpable in this vessel. When the artery was exposed further distally, it bifurcated and, thereby, proved to be an anomalous brachial artery. The bifurcation, instead of being at the level of the radial neck, was seen almost 2 inches distally. After the artery was completely freed from the median nerve and from any adhesions, and again rinsed with warm saline solution and xylocaine, the pulsation became stronger and finally could be felt as the radial wrist pulse and found faintly at the bifuraction. The brachialis muscle was entirely torn, bulging underneath the artery, and probably contributing to its compression. A small hematoma was evacuated. The joint capsule was not ruptured and the position of the fracture as far as could be ascertained by palpation alone seemed to be satisfactory. Several positions were tried to find which was the optimal for a radial pulse. Extension of the elbow had a tendency to obliterate the radial pulse while a moderate flexion to about 120 degrees was the optimal position. Rather than attempt to resuture the brachial muscle which would have encroached on the brachial artery, hemostatic sutures were placed into both muscle ends. The fascia was left open, three interrupted sutures were put through the subcutaneous tissue and the skin was closed with silk. A certain amount of tension was still present on the skin, but the pulse remained fairly strong and improved gradually during the operation; therefore, I had no apprehension about the skin suture. A posterior plaster splint was applied with the elbow in 120 degrees of extension and was suspended from an intravenous pole.

Postoperatively the pulse became normal and the hand became warm. No median nerve paralysis appeared after the operation. There was a disability of extending the fourth and fifth fingers in the metacarpophalangeal joint before the operation which persisted several days postoperatively. This was corrected by applying a posterior splint to the fourth and fifth fingers over the metacarpal

phalangeal joints. With this pressure applied, the patient was able to open and close the fist completely and the splint could be discarded after several weeks.

The end result five years after the injury has been excellent. There is no residual impairment of motion, no pain and the alignment is anatomic. There was never any evidence of Volkmann's contracture.

COMMENTS

The exploration confirmed an extreme vasospasm of the brachial artery beginning 2 inches above the elbow crease down to and including the bifurcation. The venae comitantes also were narrowed to pencil-point size but patent.

A number of factors contributed to the condition besides the ordinary "stupeur arterielle." There was a definite anatomic variation of the brachial artery. The brachial artery, instead of crossing behind the median nerve at the usual level of insertion of the coracobrachial muscle, ran distally for a distance of 3 to 4 inches behind the nerve and, therefore, probably was unable to dodge the compression exerted from behind by the bulge of the ruptured brachialis muscle and hematoma. In addition, the bifurcation took place lower than normal, namely about 2 inches distal to the elbow crease and radial neck. A fine band of adhesion ran across the brachial artery ¼ inch below the elbow crease adding a small amount of constriction. It was thought that the sympathetic block, although it did not of itself restore the radial pulse, was helpful in restoring the collateral circulation and possibly in preventing recurrence of spasm of the main stem.

CONCLUSION

In case of threatening Volkmann's ischemia of the arm, not more than two manipulations of the supracondylar fracture are recommended. Early exploration of the artery is essential since permanent neuromuscular damage sets in fast. Exploration must be guarded as there are numerous anomalies of the brachial artery in this area making this artery very vulnerable. Probably the most dangerous anomaly the surgeon may encounter is an anterior crossing of the brachial artery over the lacertus fibrosus in which the artery lies directly under the skin [*11*].

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Acinic Cell Adenocarcinoma of the Parotid Gland

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AMONG the rarest of tumors of the parotid gland is the acinic cell adenocarcinoma, unique in having strikingly clear cytoplasm similar to that of hypernephroma. Despite the indolent clinical course of the tumor early in its growth and its seemingly innocent histologic appearance, the neoplasm is definitely not benign. The cases reported here are those of two women, who are among the youngest on record, and illustrate the low-grade malignancy present.

CASE REPORTS

CASE I. L. R., a twenty-six year old white woman, was admitted to the Massachusetts General Hospital with swelling at the angle of the left jaw. The patient was entirely well until seven months previous to admission when she noted a marble-sized, tender mass at the angle of the left jaw. Three to four months previous to admission, the facial mass increased in tenderness, and was associated with dryness of the mouth. A sharp pain occurred bilaterally at the angles of the jaw when eating sour foods, especially lemons. The patient's general health was excellent, and she had gained 5 pounds in weight during the year before the hospitalization.

Physical examination on admission revealed a well nourished, young, white female with normal vital signs. A firm, fixed mass measuring 3 cm. by 3 cm. was detected at the angle of the left jaw, with surrounding swelling and tenderness. The parotid duct was grossly normal. A slight but definite facial asymmetry was noted, the lower left portion of the lip being drooped. No lymph nodes were palpable.

Roentgenographic studies consisted of sialography, which revealed a well defined mass within the parenchyma of the parotid gland.

An exploration was performed under general anesthesia three days after admission. A tumor was found on the under surface of the superficial lobe of the parotid gland, closely adherent to the facial nerve and growing underneath its main trunk. Frozen section revealed an acinic cell adenocarcinoma. A partial parotidectomy was performed, with removal of the superficial lobe and the entire neoplastic mass. During resection the tumor had to be sharply dissected from the facial nerve. The patient's postoperative course was uneventful. Six months after operation there was no evidence of local recurrence, and no lymph nodes were palpable.

The surgical specimen was an ovoid mass which weighed 14 gm. and measured 1.5 cm. by 2.5 cm. by 2.5 cm. The tumor appeared to be encapsulated and was sharply demarcated from the rim of normal parotid tissue. The external surface of the tumor was slightly nodular. Cut surface revealed firm, smooth, glistening, grey-tan homogeneous tissue with focal areas of hemorrhage, particularly in the peripheral portion.

Microscopically, the tumor was partially enclosed by fibrous tissue which in places was penetrated by lobules of tumor cells. The tumor cells were arranged in solid masses that were further divided into nests and columns by delicate fibrovascular septums. In a few areas the cells formed acinus-like spaces that sometimes contained eosinophilic material.

The tumor cells were larger than normal acinar cells, round to oval in shape, with cytoplasm that was diffusely granular in some areas and clear ("water-clear") in others. (Fig. 1.) The nuclei were generally small, dark and round, and were located centrally or eccentrically in the cell. Nucleoli were not prominent. Mitotic activity was absent. The clear cytoplasm of the neoplastic cells did not stain for fat or glycogen.

CASE II. R. R., an eighteen year old, white, single woman, was admitted to the Massachusetts General Hospital with a right preauricular swelling.

The patient first noted a swelling 2 cm. anterior to the right external auditory canal approximately four years before admission. At that time the mass was firm, movable, non-tender and painless. It

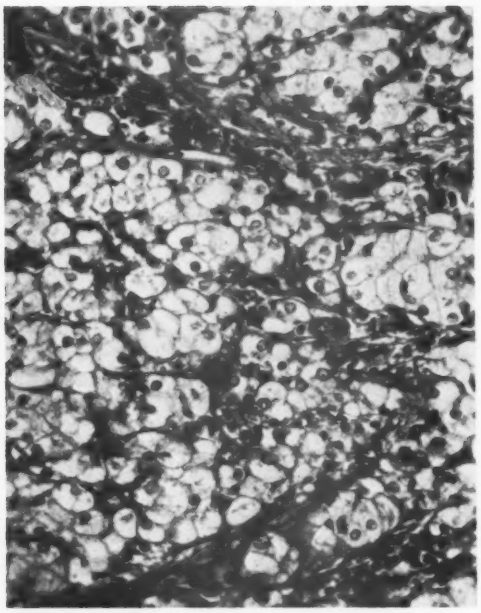

FIG. 1. Photomicrograph of the tumor from Case 1 showing the characteristic large, "water-clear" cells with small, dark nuclei of which it was composed. Original magnification × 970.

FIG. 2. Photomicrograph of the tumor from Case 11 demonstrating the presence of a nest of tumor cells (upper left) extending beyond the fibrous tissue which enclosed the main body of the tumor. Original magnification × 100.

gradually increased in size up to the time of admission. Two years previous to admission it became tender to palpation and was associated with occasional "shooting pains" which were superficial to the mass, occurred every one or two months, and lasted for several seconds. These pains did not radiate over the face. There was no difficulty in swallowing, no changes in hearing, and no facial nerve paresthesias. The patient complained of a sense of "tightness" at the corner of the right jaw when biting very hard.

Physical examination at the time of admission revealed a well nourished young woman with normal vital signs. A solitary mass measuring 2 cm. by 4 cm. was palpable 1 cm. anterior and 1 cm. inferior to the right external auditory canal. The mass was firm, moderately tender, movable, regular in outline, and appeared to be contiguous with the underlying tissues. There was no hearing defect or weakness of the facial nerve, and no impairment of the senses of pain, touch or temperature. The skin overlying the mass was within normal limits. No lymph nodes were palpable locally or distantly.

During exploration under general anesthesia, a solitary lobulated, encapsulated mass measuring 4 cm. by 2 cm. was found involving both the superficial and deep aspects of the gland. Frozen sections showed an acinic cell adenocarcinoma. A partial parotidectomy was performed, with removal of the entire tumor mass, all the superficial lobe, and half of the deep gland. One small, peripheral portion of the facial nerve which ran through the specimen was resected with it, but its ends were approximated. Nerve stimulation showed no impairment of function of the remaining branches, all of which were identified and preserved.

The patient recovered uneventfully. Three months postoperatively there was no local recurrence and no adenopathy. Except for decreased ability to elevate the right eyebrow, the facial nerve was entirely intact.

The resected specimen measured 6.0 cm. by 3.5 cm. by 1.5 cm. The tumor was firm, glistening, and grey-white. On section it appeared friable, lobulated, uniform and enclosed in a thin capsule. There was no hemorrhage, necrosis or cyst formation.

Microscopically, the tumor was not clearly encapsulated, with lobules of neoplastic cells protruding in several places beyond the surrounding fibrous tissue. (Fig. 2.) The tumor was divided into lobules by a thin, filamentous, vascular stroma. The cells were growing largely in rounded nests and columns, with acinus formation occasionally evi-

dent. There was no lymphoid infiltration, necrosis or cyst formation.

The appearance of the malignant cells was identical with those of Case 1. Large, clear cells were demonstrated, with small nuclei containing occasional nucleoli. Mitotic activity was absent. Periodic-acid Schiff stains revealed that the clear cytoplasm contained large quantities of glycogen.

COMMENTS

Case reports of acinic cell adenocarcinoma of the parotid gland are few and scattered. Perhaps the first recorded cases are those, in 1892, of Nasse [*1*], who described four parotid "adenomas" composed of cells that resembled normal parotid acinic cells.

Masson, (Plate I, Figs. C and D, [*2*]), in 1924, illustrated a rapidly-growing parotid tumor with large clear cells. In 1926 a tumor of acinic cell origin was found by Schutz [*3*] in an eighteen year old girl. The mass was present for three years before examination and was mildly painful for one year.

The exhaustive study of salivary gland tumors by Ahlbom (Table xv, Fig. 29, [*4*]) in 1935 included two "adenomas," one of which may have been an acinic cell adenocarcinoma. The patient was a forty-two year old man who noted a unilateral painless enlargement for two years. Stewart [*5*] observed that several of the parotid tumors which he had classified as mucoepidermoid had extraordinarily clear cytoplasm suggestive of hypernephroma.

More recently, isolated cases have been reported by several authors [*6–9*]. In addition, mention has been made of the acinic cell adenocarcinoma in a series of salivary gland tumors [*10–14*]. Ross (Fig. *15*, [*15*]) and Anderson [*16*] illustrated the tumor without clinical correlation.

In 1950 Howard [*17*] reported the youngest known patient with acinic cell adenocarcinoma, a white girl who was four years old when parotid enlargement was first noted. Recurrent tumors were excised four times before death from distant metastases occurred at forty-three years of age.

Recognition of the fact that at least some of the acinic cell tumors were malignant was a contribution of Buxton [*18*]. He reported that four patients died of metastases after an unspecified period of time.

Foote and Frazell [*19,20*] found twenty-one acinic cell adenocarcinomas among 766 parotid tumors. This group, with six additional cases, was reported by Godwin, Foote and Frazell [*21*], and constitutes the largest series published in the literature. No paralysis of the facial nerve was seen on initial examination. Over half the patients studied developed recurrences at some time. Four patients died of the disease, one had both local and distant metastases, the remaining three had metastases to the lungs.

From this review of the world literature on acinic cell adenocarcinoma, it is apparent that the tumor reaches its peak age incidence in the fifth and sixth decades. However, very young patients have rarely been reported. Women are involved more than twice as often as men.

Clinically, the tumor usually begins as a very slowly progressive, unilateral, asymptomatic swelling of the face. Pain is a late sign, appearing only months to years after the onset of swelling, and is never severe. Hearing defects or dysphagia are very rare. Paralysis of the facial nerve on intial examination has been reported by only one author [*18*]. Published reports of systemic signs of malignancy have not appeared. The initial clinical impression is entirely consistent with benign mixed tumor of the parotid gland. On physical examination the mass is firm but not hard, not adherent to skin or fixed to deep tissues.

Even at operation, the acinic cell adenocarcinoma may simulate a benign tumor. It is round, almost invariably enclosed by fibrous tissue, but not particularly firm. The tumor can easily be detached from the surrounding normal parotid gland. Gross hemorrhage, necrosis or local extension of the tumor is usually not seen.

On section, it is greyish white, homogeneous in texture, and lobulated. Although the intact growth may simulate a mixed tumor, the cut section lacks the latter's characteristic moist myxomatous appearance.

The derivation of the tumor has been controversial. Evidence for the parotid gland acini as the source of the neoplasm has been summarized by Godwin [*21*]. Attention was directed to the histologic similarity of tumor cells to the smaller, normal acinar cells. The presence of foci of serous secretions was demonstrated in occasional sections of the tumor. Finally, periodic-acid Schiff staining has revealed histochemical similarities between the granules of the tumor cells and the cytoplasm of normal acinar cells.

The malignancy of the tumor was not

recognized early, due largely to its seemingly benign clinical course, both before and after resection, and to its low mitotic activity. The finding in some of the sections of nests and ectopic foci of cells within the stroma surrounding the tumor provides definite histologic evidence of malignancy. (Fig. 2.) It is now apparent that distant metastases as well as local recurrences can occur. Metastases have developed in about 10 to 20 per cent of the recorded cases, but the follow-up treatment has generally been inadequate. When the metastasis has been studied, it was described as structurally similar to that of the parent lesion.

The treatment of acinic cell adenocarcinoma is greatly dependent upon clinical judgment. The knowledge that death can occur from what appears clinically to be a benign lesion should promote early and thorough excision of any suspicious mass. Simple enucleation of the tumor is not likely to remove all of the malignant cells, especially since no true capsule exists, and local recurrence occurs in half the reported cases. In those instances in which the tumor is closely adherent to the facial nerve, as in Case 1, the resection of the contiguous portion of the nerve may be indicated.

SUMMARY

The occurrence of acinic cell adenocarcinoma of the parotid gland in two young women is reported. Despite the history of slow growth of the tumor with only minor symptoms, and the presence of an apparent capsule at operation, microscopic sections show clear evidence of malignancy.

Histologic diagnosis is not difficult as the "water-clear" cell makes the appearance of the tumor distinctive. Other aspects of the pathologic and clinical characteristics of the tumor have been reviewed.

Surgical treatment should be based upon the knowledge of common local recurrence and occasional distant metastases.

Acknowledgment: I am indebted to Dr. Robert Scully of the Department of Pathology and Drs. John Raker and John Constable of the Department of Surgery of the Massachusetts General Hospital for suggestions in the preparation of the manuscript.

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Obstructive Uropathy Due to Prostatic Hypertrophy

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PATIENT H. R., a sixty-four year old white man, was admitted to the hospital because of urinary retention. He had had symptoms of prostatism for ten years. During the year prior to admission, these symptoms became more severe. The major manifestations were progressive decrease in size and force of the urinary stream, marked diurnal frequency, hesitancy, urgency, nocturia four to six times, and occasional burning on urination. He had not had chills, fever, or gross hematuria. He had never had gonorrhea. Catheterization had never been necessary. At the time of admission, the patient had not been able to void for twelve hours.

PHYSICAL EXAMINATION

The patient was a well developed white man. He was in moderate distress because of lower abdominal discomfort. His temperature was 98.6°F.; pulse, 84 per minute; respirations, 22 per minute; blood pressure, 130/70 mm. Hg. Positive findings were limited to the abdominal and rectal examinations. The urinary bladder was palpable to within 4 cm. of the umbilicus and painful to palpation. Digital examination of the prostate gland revealed a three-plus enlargement. The gland was firm, smooth and benign in character.

LABORATORY DATA

The hemoglobin was 14.6 gm. per cent; hematocrit, 44 per cent; and white blood cell count, 7,700 per cu. mm. (neutrophils 78 per cent). The urinary pH was 5.5; specific gravity, 1.008; albumin, 100 mg. per cent. There was no sugar present. The microscopic examination showed each high power field to be filled with red blood cells. The specimen had been obtained after catheterization. There were no organisms in the stained sediment. The two-hour phenolsulfonphthalein excretion test was within normal limits. The blood urea nitrogen was 15 mg. per cent; acid phosphatase, 0.6 Shinawara, Jones and Reinhart units; fasting blood sugar, 98 mg. per cent; and prothrombin activity, 85 per cent. The electrocardiogram and roentgenograms of the chest were normal. An excretory urogram showed prompt bilateral excretion of the dye. The calyces, pelves and ureters appeared normal. (The bladder was elevated and showed marked hypertrophy of its wall and intravesical prostatic protrusion.)

EARLY MANAGEMENT

The patient was admitted to the hospital, with a diagnosis of acute and chronic urinary retention secondary to benign prostatic hypertrophy. He was easily catheterized with a No. 22 F. Foley catheter. Six hundred milliliters of urine was removed and the catheter clamped. The release of this amount relieved most of his discomfort. At that point the upper limit of the bladder was palpated mid-way between the symphysis pubis and the umbilicus. The following orders were written: (1) regular diet as tolerated; (2) complete blood count, urinalysis and blood urea nitrogen, immediately; (3) record of intake and output; (4) vital signs taken every four hours; (5) decompression of urinary bladder at rate of 100 ml. of urine per hour;

(6) 100 mg. of Furadantin® administered orally every six hours. When the patient began to have symptoms of bladder spasm, the oral administration of 15 mg. of Pro-banthīne® every six hours was ordered. After the bladder had been completely emptied by slow decompression, the catheter was attached to a straight drainage tube. The catheter was then irrigated twice daily with normal saline solution in order to wash out any crystalline material or debris that might have accumulated.

FURTHER COURSE

During the patient's next two hospital days, he underwent general investigation, including excretory urograms, roentgenograms of the chest, electrocardiogram and selected blood chemistry studies. No other abnormalities were found. During this time his oral intake and urinary output were adequate. He was ambulatory and remained afebrile.

SURGERY

On the third hospital day, with the patient under general anesthesia and in the lithotomy position, a bilateral vasotomy, cystoscopy and urethroscopy were performed. The latter two procedures showed a moderately trabeculated bladder and marked intravesical protrusion of a large prostate gland, benign in appearance. Because the gland was very large, enucleation by retropubic prostatectomy was considered more desirable than prolonged transureteral resection. The patient was placed in the supine position. After preparation of the skin and draping, a vertical midline suprapubic incision was made. The urinary bladder was exposed. It was retracted posteriorly and superiorly and the space of Retzius entered. The anterior prostatic capsule and area of the vesical neck were then exposed. Since the prostate was again noted to be a very large, broad gland, a vertical capsular incision was made rather than the usual transverse incision. This was performed with a high frequency cutting current through the prostatic capsule and the distal versical neck. The adenomas were enucleated by blunt and sharp dissection. Hemostasis was secured with chromic catgut sutures. Since the vesical neck outlet was adequate, no revision was necessary. A No. 24 F. Foley catheter was passed into the bladder per urethra and the prostatic capsule closed with chromic catgut sutures. A Penrose drain was placed in the prevesical space and brought out at the lower angle of the wound. Routine closure was then performed. The weight of the specimen was 160 gm. The pathologic report was nodular hyperplasia of the prostate. The patient's postoperative course was uneventful. He was discharged on the tenth postoperative day.

COMMENTS

The case previously reported outlines an acceptable course of management of the patient with acute and chronic urinary retention due to a large benign hypertrophied prostate gland. All such patients are admitted to the hospital. In addition to a complete history and general physical examination, certain routine laboratory tests are performed. These include urinalysis with a stained smear of the urinary sediment. Urine culture is taken if the routine analysis shows the urine to be infected. A complete blood count, blood serology, fasting blood sugar level, determination of blood urea nitrogen, prothrombin activity, and determinations of alkaline and acid phosphatase are also obtained. In cases of persistent unexplained hematuria, further hematologic studies are performed.

Renal function is determined by the two-hour phenolsulfonphthalein excretion test. Excretory urography is performed if the level of blood urea nitrogen is below 40 mg. per cent. Usually the urogram will also give a gross idea of renal function.

Routine roentgenograms of the pelvis and lumbosacral spine are taken to rule out possible metastatic lesions to these common sites from an unsuspected prostatic carcinoma, other osseous lesions and ureteral and vesical calculi. Posteroanterior and left lateral roentgenograms of the chest are also obtained. The cardiac status is evaluated by a carefully taken cardiovascular history, physical examination, daily determinations of blood pressure and the electrocardiogram. If necessary, determinations of venous pressure and circulation time are obtained. Medical consultation is often sought to help in evaluating the surgical risk. Nutritional deficiencies and anemia are corrected preoperatively. Diabetes mellitus is adequately treated and controlled. Whether the bladder of the patient with chronic urinary retention should be slowly decompressed or allowed to empty rapidly is still a matter of judgment. We believe that slow decompression should be

employed in an attempt to avoid bleeding from sudden congestion and rupture of the mucosal veins of the bladder and sudden reduction of pressure in the renal collecting system. If the blood urea nitrogen level is elevated, catheter drainage is continued until it falls within normal limits or becomes stabilized. Decreased renal function and azotemia, when secondary to prostatic obstruction, can usually be corrected by free urinary drainage. Prophylactic chemotherapy or antibiotic therapy should be used to lessen the possibility of ascending pyelonephritis, urethritis and epididymitis. After the patient has been evaluated and judged to be suitable for surgery, bilateral vasotomy and prostatectomy are performed. Transurethral resection is the procedure of choice if the amount of hypertrophied prostatic tissue can be readily resected within one hour. Retropubic prostatectomy is the preferable procedure for larger glands. Bilateral vasotomy is performed to prevent postoperative epididymitis.

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The Wringer Injury

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IN this age of power driven appliances any general practitioner, pediatrician, or surgeon may be called upon to treat the so-called "wringer arm injury." Early adequate care can significantly reduce the morbidity arising from this condition. Recorded in the present case analysis is a method of management of such an injury.

Patient E. M. H. (No. 134,091), a six year old girl, was brought to the Emergency Room of The Children's Hospital on January 10, 1959. Two and a half hours previously, she had climbed on top of a baby carriage adjacent to the washing machine which was unattended. While reaching into a cupboard above, she had slipped from her precarious perch and grasped for the washing machine in an effort to break her fall. The rollers clutched her right arm and drew it through the wringer to the elbow level. Pressure continued until the arm was released thirty to sixty seconds later. She was taken first to another hospital then referred to The Children's Hospital for treatment.

PHYSICAL EXAMINATION

At the time of admission the right arm was already grossly swollen. The flexor surface of the forearm showed deep ecchymosis with bluish red discoloration. In the antecubital fossa, an ovoid area of skin measuring 5 by 3 cm. was superficially abraded and markedly reddened. Although the child was hesitant about moving the arm, no neurologic defect was present. A good radial pluse was palpable at the wrist and no free fluid was demonstrable in the subcutaneous tissues. Beyond this, she showed no other injury.

MANAGEMENT

Initial dressing was done in the emergency room using the aseptic technic. The entire arm was washed thoroughly with pHisoHex® and aqueous Zephiran.® Adaptic tulle impregnated with Furacin® ointment was placed over the abrasion and the arm encased in a firm pressure dressing. The initial layers consisted of a large amount of fluffed gauze bound in place with a circular kerlex bandage. Particular attention was paid to the hand which was placed in a position of function with the fingers individually separated and the tips exposed in order to check the circulation. Further pressure was applied with a circular elastic bandage and the dressing covered with a long piece of stockinette measuring 3 inches which was split longitudinally at the shoulder level and rejoined under the opposite axilla. Roentgenograms of the arm showed no fracture, and the child was admitted to the ward. Here the arm was suspended from an intravenous stand using a pulley, rope and counterbalancing weight.

HOSPITAL COURSE

The dressing was changed eight hours later. Examination of the arm at that time again showed no evidence of arterial thrombosis or nerve damage. Marked edema of the flexor surface of the forearm persisted. The area of skin abrasion was now bluish black with fluctuation beneath it. Aspiration of this area produced 10 cc. of old blood. A pressure dressing similar to the first was applied and the arm was resuspended.

At the second change of dressing twelve hours later, little change had occurred. Another 10 cc of blood were aspirated from the antecubital area. After forty-eight hours in the hospital the edema was subsiding and the damaged skin was still intact. Only 4 cc. of fluid was now present within the subcutaneous loculation.

By the fourth hospital day, further reduction in edema had occurred. Slight serous drainage

was present on the dressings but no subcutaneous fluid had reaccumulated. At this time the arm, still in pressure dressings, was placed in a sling. On the sixth hospital day, viability of the damaged skin seemed assured and the patient was discharged.

COMMENTS

Wringer injuries are more common in children two to four years of age when curiosity without sagacity controls the child's actions. In the older child there is usually an accidental aspect present when such an injury occurs. Tissue damage is directly proportional to the intensity of pressure applied. Therefore, the larger arm of the older child may be injured even with a relatively loose wringer.

When initial examination of the extremity shows only edema without marked damage to the skin or muscle, the dressings are usually left undisturbed for a period of twenty-four to forty-eight hours. However, in instances such as the one described herein, when collection of fluid beneath damaged skin could further jeopardize the vitality of tissue, early and more frequent change of dressing is advised. Fluids may then be released by aspiration, skin incision, or fasciotomy.

Drainage is improved tremendously by initial elevation. Immobilization either by a collar and cuff sling or Velpeau dressing should be continued until most of the edema has subsided.

If attention is paid to the care of wringer injuries, we believe that the end result in most cases will be quite satisfying.

SUMMARY

The evaluation and early and late management of the wringer arm injury is presented.

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Torsion of the Spermatic Cord

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PATIENT R. H., a twenty-five year old unemployed construction worker, was in good health until thirty-six hours prior to admission to the hospital. Upon sitting up in bed, a sudden knife-like pain in the right scrotum made him double up and fall back, unable to move. He became nauseated immediately and vomited the entire contents of the stomach. The acute pain lasted for approximately five minutes and then decreased in intensity. He was able to get up and around and within a few minutes had a large diarrheal stool.

Following this episode, the patient noticed a pain which originated in the right testicle and radiated to the right inguinal region and right flank. This pain was aggravated on moving or standing erect. It was relieved by lying on the right side with the thighs flexed on the abdomen. During the next ten hours, the pain increased and was accompanied by swelling, tenderness and erythema of the right side of the scrotum. The patient consulted his family physician who stated that he had an infection in the testicle and advised the wearing of a scrotal support. No medication was given.

For the next twenty-four hours, the pain remained static, but the swelling and tenderness of the right scrotum increased until the patient was unable to stand, walk, or find a comfortable position. He became relatively anorexic, but retained fluids and was able to void spontaneously without abnormal symptomatology. He had no further bowel movements.

PHYSICAL EXAMINATION

The patient reported to the emergency room at this hospital approximately thirty-two hours following the onset of his difficulty. Physical examination was within normal limits except for a temperature of 99°F. and the findings in the right scrotum. The skin of the scrotum was erythematous and warm to touch. There was a globular swelling of the scrotal contents to approximately twice the size of the left side. Marked tenderness to palpation or manipulation of the right scrotum was noted and the anatomic structures of the contents were not definable. The spermatic cord at the external inguinal ring was normal in caliber and nontender; no hernia nor palpable lymph nodes were noted; the scrotal mass could not be transilluminated.

LABORATORY DATA

Urinalysis was within normal limits. Complete blood count showed a leukocytosis of 18,800 per cu. mm. with 80 per cent polymorphonuclear cells.

MANAGEMENT

The working diagnosis was torsion of the spermatic cord immediately proximal to the testicle; however, the long interval since the onset of symptoms made continued viability of the testicle appear doubtful. Because of the possibility of preserving the function of the organ, surgical intervention was undertaken. On opening the scrotum, approximately 60 cc. of bright red blood was found within the tunica vaginalis and a 360 degree, counterclockwise, intravaginal twist of the spermatic cord was noted. The testicle appeared ischemic and remained so following the release of the torsion. Retrograde thrombosis of the pampiniform plexus was present. A right orchiectomy was performed with excision of the spermatic cord to the external inguinal ring. (Fig. 1.) Investigation of the left scrotum showed some laxity of the insertion of the testicle. Orchidopexy was performed. The postoperative course

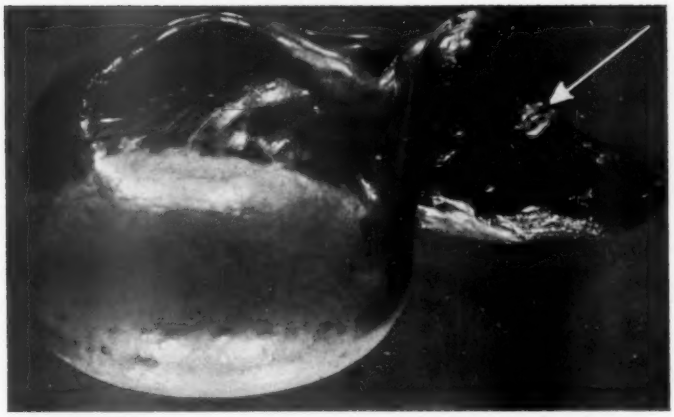

FIG. 1. Specimen showing testicle removed. Note area of torsion of spermatic cord (arrow).

was uneventful. Pathologic report of the specimen showed ischemic necrosis of the testis and epididymis with interstitial hemorrhage.

COMMENTS

The clinical narrative previously presented is typical of this disease process. Reviews of collective series of these cases disclose that approximately 77 per cent of testes are nonviable at the time of surgical correction. Relief of the torsion within four to six hours gives almost a 100 per cent chance of a functioning testicle. All torsions not relieved in twelve hours will result in a necrotic, functionless organ.

The two significant points in this case are: (1) delay of the patient in seeking medical aid; and (2) misdiagnosis of the pathologic condition. Little can be done to change the former, but closer attention to minor points in the history of the condition and in the physical findings may help reduce the delay in surgical correction.

The most common conditions with which torsion of the spermatic cord is confused are acute epididymitis and incarcerated hernia. In torsion of the cord, there is rarely a history of antecedent disease or urinary symptoms. The symptoms are sudden in onset, usually preceded by minor physical exertion; fever is not present early; physical findings are a globular swelling of one side of the scrotum where the epididymis cannot be delineated. The spermatic cord above the scrotum is neither thickened nor tender; the opposite scrotal contents are quite normal; rectal examination shows no widespread inflammatory process and urinalysis is usually within normal limits.

Predisposition to torsion of the spermatic cord is always present in the formation of the following anatomic variations of the scrotal contents: (1) a long mesorchium with the epididymis separated from the testicle throughout most of its length; (2) a horizontal testis with the spermatic cord inserting near the middle of the epididymis; (3) an inverted testicle with the spermatic vessel and vas deferens separated from the body of the epididymis; and (4) complete investment of the testicle, epididymis and lower portion of the spermatic cord by the visceral layer of the tunica vaginalis.

This fourth condition is the most common. It leaves the contained structures hanging in the potential cavity of the tunica vaginalis and free to rotate about the axis of the spermatic cord. The cremasteric muscle fibers enclose the cord and testicle in an interlacing fashion, and sudden contraction, minor as it may be, can cause the testicle to twist on its axis any number of times. Usually, the venous blood supply is immediately interrupted and the arterial supply is partially obstructed. As edema accumulates, the arterial blood supply becomes completely occluded and infarction occurs. Prior to this time, release of the torsion will preserve a viable, functioning organ.

Treatment of choice is surgical release of the torsion along with fixation of the testicle

within the scrotum. Either immediate or interval orchidopexy of the unaffected side should be performed as the anatomic variations occur bilaterally in over 75 per cent of patients.

SUMMARY

A case of prolonged torsion of the spermatic cord with resultant necrosis of the testicle is presented with a discussion of the condition and aids in diagnosis. Early diagnosis and surgical correction are mandatory to maintain a viable testicle and provide the best chance for future function.

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SPECIAL DEPARTMENTS

Surgery Court Cases

HOWARD NEWCOMB MORSE,* *Atlanta, Georgia*

DILL VS. SCUKA

District Court of the United States for the Eastern District of Pennsylvania

175 F. Supp. 26

The patient was hospitalized in the Wesley Hospital in Wichita, Kansas. He had a blood clot which affected his left foot and the calf of his left leg. This infirmity interfered with his ability to perform his duties as a service specialist for the local gas company. He was stricken while in his office. Two other blood clots developed in his chest while he was in the hospital, but they disappeared after he was given a hypodermic injection.

In order to further diagnose the tendency to blood clotting found in his patient, the attend-physician requested the staff urologist and the staff radiologist to perform an aortogram on the patient. The patient consented to the procedure and discussed it at various times with the attending physician and the urologist. The urologist examined the patient, checked his prothrombin time and apparently found no contraindication for the aortogram.

A general anesthesia was administered by the staff anesthetist. In the attempt to inject dye into the aorta, the urologist was not satisfied with the nature of the blood found in the patient and discontinued the procedure. The attending physician was not present during the procedure and had no control over it. The patient knew that the urologist and not the attending physician would perform the aortogram.

About a week after the attempted aortogram, during which time the patient suffered great pain and writhed in bed, the function of the nerves in the patient's lower extremities deteriorated, and he lost control of his lower legs from the hips down. He suffered what was described as "a flaccid paralysis."

The patient brought an action to recover damages from the attending physician. The District Court of the United States for the Eastern District of Pennsylvania rendered judgment in favor of the attending physician. The District Court declared. "Defendant, as the attending physician, by recommending a procedure to be performed by a specialist, is not liable for the alleged negligent acts of the specialist."

MCGULPIN VS. BESSMER

Supreme Court of Iowa

43 N. W. 4d 121

On May 25, the patient, a machinist who was fifty-five years of age, went to the office of the surgeon in Davenport, Iowa, and asked for injections for varicose veins in his legs. On the patient's second visit, the surgeon (whom the patient wanted to see) referred him to a young assistant surgeon with the assurance that the latter was an expert on the treatment of varicose veins.

The assistant surgeon told the patient that the injection method was obsolete, futile and endless, and that the modern method was liga-

* Counsellor at Law of the Supreme Court of the United States of America.

tion. To the patient's inquiry as to whether such an operation was dangerous, the assistant surgeon assured him, "We can do it in fifteen minutes in the office." The patient asked if he would lose time from work and was told that he would not.

As directed, the patient returned to the surgeon's office the next day and was then instructed to go to Mercy Hospital the following morning. The patient objected to going to a hospital but the assistant surgeon said, "Don't be foolish. You won't have to stay there over half an hour and can go home and about your business." Actually, the operation on the morning of June 9 on only one leg started about 9 A.M. and it was after 12 noon when it was completed. When the outer vein had been removed from the patient's right leg the assistant surgeon announced, "We had better let the other leg go until we see how this turns out." He said that he "didn't know how it was going to turn out. Maybe I am in an awful fix." This prophecy proved more accurate than the assistant surgeon's previous assurances.

The assistant surgeon then told the patient he could not go home until midafternoon, and a few minutes later he said, "Now that we have you here we are going to keep you." The patient was kept in the hospital four days and then taken home on a stretcher. "Before I got home my leg was a little blue and swelling. After I got home the whole foot turned black. I was in such misery I couldn't stand it and my wife called the doctor." The assistant surgeon then called on the patient almost daily and, after a week, ordered the patient's return to the hospital in an ambulance on June 20.

On June 22, the surgeon told the patient, "We are going to have to take that foot off right away." When the patient became anxious and accused the surgeon of making him "a cripple," the doctor made no denial of the charge but assured the patient that he (the surgeon) would see that the patient obtained steady employment. "At that time he also promised me an artificial foot." After June 23 neither the surgeon or his assistant saw the patient again.

Before the surgeon and his assistant last saw their patient, and thereafter, his leg had "turned purple and in places black with white streaks through it, it was swollen quite a bit, and felt like it was on fire." The patient could scarcely endure the pain, and frequent injections were necessary for this. On June 27, another physician arranged for the patient to be taken to the State University Hospital at Iowa City where his leg was amputated below the knee on July 7 and at the mid-thigh on July 27th. He was discharged from the hospital on August 13. Amputation of the leg was necessary because of gangrene caused by occlusion of the femoral artery.

The patient filed an action in the District Court of Scott County, Iowa against the surgeon to recover damages for the alleged malpractice of the surgeon's assistant. The court entered judgment in favor of the surgeon, and the patient appealed.

The Supreme Court of Iowa reversed the decision of the lower court. The Supreme Court stated: ". . . the cause of the gangrene was either mistaken ligation of the artery, or injury thereto, by . . . (the assistant surgeon). One of these causes, both chargeable to . . . (the assistant surgeon), seems probable, not merely possible, and more probable than any other cause based on the evidence. It is not necessary that the proof be conclusive or exclude every other suggested or possible cause."

Our Surgical Heritage

D. P. HALL, M.D., *Surgical Department, University of Louisville, Louisville, Kentucky*

UNITED STATES OF AMERICA

JOHN MORGAN

JOHN MORGAN was born in Philadelphia in 1735, the son of a wealthy prominent citizen. Morgan was educated in the classics at Nottingham Academy and proceeded to the College of Philadelphia from which he was graduated in the first class of 1757. It was during the latter years of his study in this institution that he became a student of medicine under Dr. John Redman. Soon thereafter he became a surgeon as well as a lieutenant in the line during the French and Indian War in 1758, and was attached to Forbes' expedition against Fort Duquesne.

In 1760 Morgan sailed for Europe to continue his medical studies. In London, he worked with William Hunter for a year, then spent two years in the University of Edinburgh, from which institution he was granted the degree of M.D. in 1763. His thesis, "De Puopoiesi" was a master contribu-

tion to surgery, but went unrecognized. In short he postulated that in inflammatory lesions the true secretion of pus was from the blood vessels. It ramined for Cohnheim, one hundred years later, to verify the truth of Morgan's thesis.

Continuing his European sojourn he went to Paris where he spent a winter in the study of anatomy. He was well received by Morgagni and by Voltaire. Morgan was made a member of the Academy of Surgery in Paris and became a Licentiate of the College of Physicians of London and a member of the College of Physicians of Edinburgh.

Dr. Morgan returned to Philadelphia in 1765 and with the collaboration of Dr. William Shippen, Jr. a medical school was established in connection with the College of Philadelphia, known as the Medical Department of the University of Pennsylvania. With the beginning of the Revolutionary War in 1775, Morgan was appointed Director General of the military hospitals and Physician in Chief to the American Army. His army experience was not too happy as many differences and quarrels arose between other physicians in the service.

John Morgan was a brilliant surgeon, a delightful personality and certainly a diligent worker in the cause of American liberty. His idea and ambition in establishing the University of Pennsylvania Department of Medicine as the first medical school in the United States alone insures his fame but his fight for sound premedical education should be remembered.

EUROPE

WILLIAM CHESELDEN

WILLIAM CHESELDEN, he of "lithotomy fame," was born on October 19, 1688, in Somerby, Leicestershire, England. He was descended from a wealthy family of graziers who it seems contributed several members to the medical profession. William Cheselden received a good classic education and was apprenticed to Mr. Wilkes, a surgeon of repute in Leicester. In 1703 he studied anatomy as a house pupil of William Cowper. He was an apprentice for seven years to James Ferne, a surgeon to St. Thomas' Hospital. Cheselden was admitted to the freedom of the Barber-Surgeons Company in 1710 and given a full certificate to practice as a surgeon. In 1719, he was made a surgeon to St. Thomas' Hospital and was appointed surgeon to Queen Caroline in 1727. In 1729 when the French Royal Academy of Surgery was founded he was made the first foreign member. At the founding of St. George's Hospital in 1733, William Cheselden was selected as one of the surgeons and in February 1737 he was appointed surgeon to Chelsea Hospital.

Cheselden took an active part in separating the barbers and surgeons in the Barber-Surgeons Company, which was ultimately accomplished. William Cheselden became master of the Surgeons Company in 1746.

William Cheselden published a "Treatise on the High Operation for the Stone" in 1723. He is probably best known for this and for his early teaching of anatomy and surgery in England and also as the one man who raised English surgery from the commonplace.

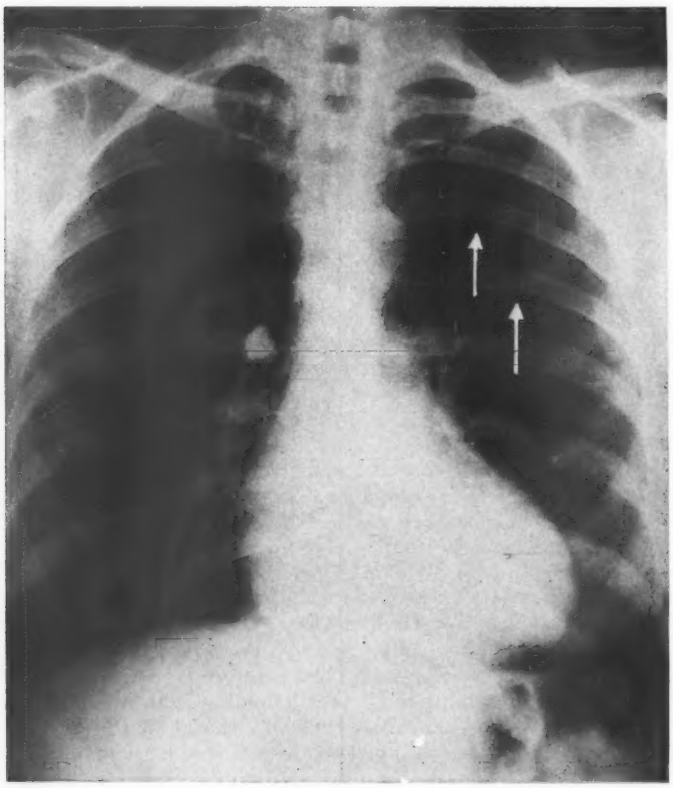
While living in Queens Square, Westminster, in 1735, the great Alexander Pope became his patient and it was he who wrote the couplet: "I'll do what Mead and Cheselden advise, To keep these limbs and to preserve those eyes."

William Cheselden died on April 10, 1752, following a paralytic stroke and is buried on the north side of the burial ground of Chelsea Hospital. His tomb can still be seen from Queens Road.

The Diagnostic Corner

SIDNEY W. NELSON, M.D., *Department of Radiology, The Ohio State University, Columbus, Ohio*

An interesting problem of differential diagnosis in a patient with unilateral notching of the ribs.



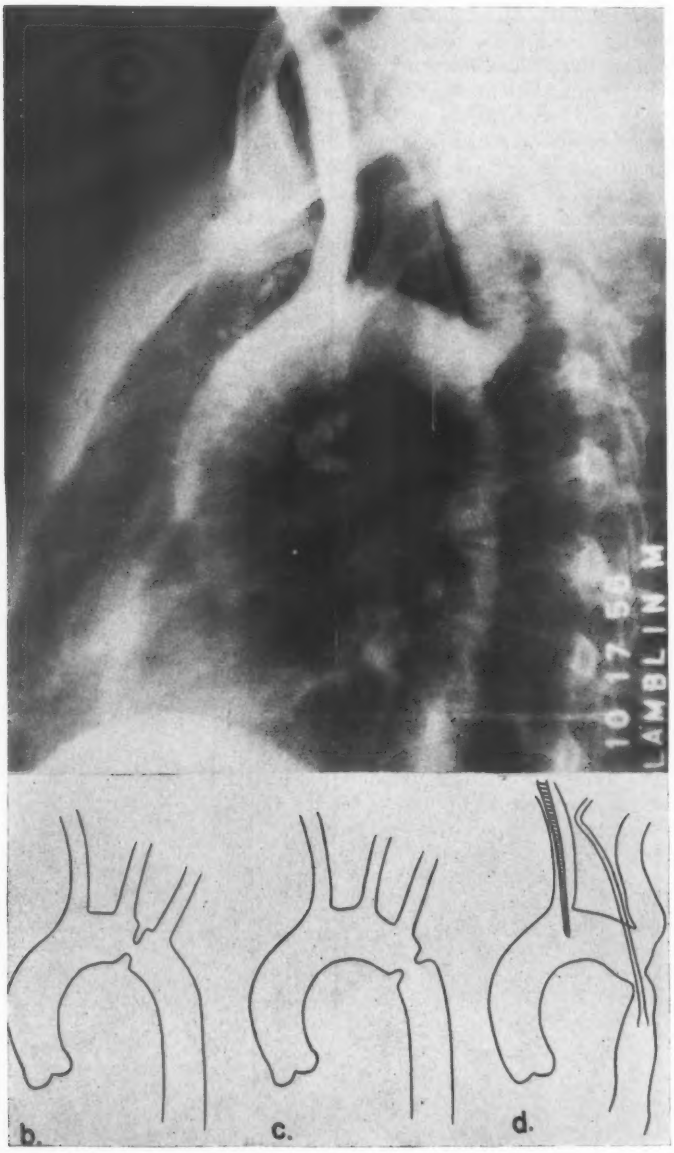
THIS forty-five year old white woman was admitted to the Ohio State University Hospital complaining of easy fatigability, pain in the left anterolateral side of the chest, headaches, and a throbbing pain in the right side of her neck. The patient had a history of occasional sensations of dyspnea, which was sometimes accompanied by chilly sensations, for five to eight years. For at least five years she had noticed definite exertional dyspnea and increasing fatigability. She had been examined previously in another hospital and had been told that she had a type of disease involving her heart valves and some "mixed-up blood vessels in her chest." There were no previous episodes of cardiac failure, and there was no history of rheumatic heart disease. The patient had known that she had high blood pressure for many years. The only significant past history was the fact that at the age of six years the patient had had a fever, at which time her family physician discovered a heart murmur. The patient's parents were told that she probably had "rheumatic heart fever." The patient did not have any pain in her joints or other manifestations of rheumatic fever.

She was well nourished, well developed and in no distress at the time of admission. Temperature, pulse rate, and respirations were normal. The blood pressure in the right arm was 100/60 mm. Hg, 170/80 mm. Hg in the left arm, and was recorded as 90/40 mm. Hg in both legs. At the time of physical examination prominent pulsations were noted in the right common carotid artery. The left brachial pulse was of good quality, whereas the right brachial pulse was weak. Both femoral pulses were decreased in intensity. Examination of the heart revealed a normal sinus rhythm with a grade 3 systolic murmur which was audible over the precordium and posterior left thorax, with transmission of the murmur into the neck.

On admission the hemoglobin was 11.7 gm. per cent with 4.2 million red blood cells per cu. mm. White blood count was 6,600 per cu. mm. with a normal differential. All other laboratory studies were normal. Multiple arterial punctures were performed and direct pressure measurements showed the pressure in the right brachial artery to be 135/65, 205/65 in the left brachial artery, and 140/65 mm. Hg in the right femoral artery. Pulmonary function studies were within normal limits. Electrocardiogram showed a complete right bundle-branch block. A roentgenogram of the chest showed extremely minimal notching of the inferior surfaces of the posterior segments of the left fifth and sixth ribs. *What is your diagnosis?*

Please turn page for answer

Diagnosis: Coarctation of the aorta distal to a normally located left subclavian artery, but proximal to an ectopic right subclavian artery.



The physical findings in this patient were diagnostic in themselves, although this is a somewhat unusual combination of coarctation and ectopic vessel. The vast majority of cases of coarctation occur just distal to the left subclavian arteries, with the result that the blood pressure and arterial pressure measurements are usually equally elevated in both upper extremities. Furthermore, the collateral arterial pathways develop bilaterally via the internal mammary branches of the subclavian arteries. Thus, in the ordinary case of coarctation of the aorta, the rib notching is usually bilateral inasmuch as the extra flow must be carried from the internal mammary artery through the intercostal arteries on both sides and thence into the aorta distal to the coarctation. A second, and more unusual type of coarctation, occurs proximal to the normally located left subclavian artery. In this type of coarctation, the elevation of the arterial pressure occurs only in the right arm, because the left subclavian is on the distal (low-pressure) side of the coarcted segment. Thus, the rib notching will occur only on the right. In the patient presented herein, the elevated blood pressure and direct arterial pressures were confined to the left arm. The only rib notching seen was extremely minimal and limited to the left fifth and sixth ribs posteriorly. This set of circumstances can occur only if the coarctation is distal to the normally-located left subclavian, but proximal to an ectopic right subclavian.

A retrograde aortogram clearly showed the nature of the clinically suspected lesion. The line drawings below the illustration demonstrate the three types of coarctation discussed.

The short segment of coarcted aorta was resected and an end-to-end anastomosis was performed. The patient had an uneventful postoperative course and was discharged with a good prognosis.

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Book Reviews

Handbook of Physiology, Section I. Neurophysiology, Volume I. Editor in Chief, John Fields; Section Chief, H. W. Magoun; Executive Editor, Victor E. Hall. 777 pages. Williams & Wilkins. Baltimore, 1959. *$22.00.*

This is the first of a series of volumes to be published under the auspices of the American Physiological Society. Because of the great advances in neurophysiology within the past twenty or thirty years, the Society elected to devote the first three volumes to this subject. The first volume consists of a series of essays by over eighty of the foremost neurophysiologists of the world dealing with subjects in which they are particularly expert. The subject matter is treated at as high a level as space will permit. It is not directed toward the beginning student but toward the graduate student or research worker. The essays are selected to give a comprehensive picture of the field of neurophysiology from its inception to the present, and various facets are presented in proportion to their importance regardless of the time at which discoveries were made. An introductory chapter by Mary A. Brazier on the historical development of neurophysiology is almost a small monograph in itself. This first volume covers the general topics of brain potentials and rhythms, sensory mechanisms and vision.

A great deal of hard work, insight and judgment has been exerted by the editors to provide a firm basis from which progress can continue in this rapidly growing field. The volume should be available to all physiologists, neurologists and neurosurgeons. It will be a standard reference work for many years to come.

WILLIAM E. HUNT, M.D.

Arterial Embolism in the Limbs. By A. L. Jacobs, M.A., D.M., F.R.C.P. 200 pages. Williams & Wilkins Co. Baltimore, 1959. *$8.00.*

Dr. Jacobs has presented a good statistical analysis and discussion of the problem of arterial embolism. This work is actually a summary of his own experiences with 122 arterial emboli, and a summary of the world literature to the present time on the subject. Although his own approach to the problem is chiefly non-surgical (only six explorations for embolus), he discusses the specific indications for surgical intervention and correlates the clinical course of his patients with autopsy findings in those subsequently followed up. Dr. Jacobs points out the sources of error in some of his own cases, and outlines a very clear program for the prevention of failures in diagnosis and therapy. The author concludes with an unusual and interesting study involving the injection of radiopaque material in the arteries of cadavers for the demonstration of collateral circulation.

WILLIAM C. PACE, M.D.

The Truth About Your Eyes. By Derrick Vail, M.D. 180 pages. Farrar, Straus & Cudahy. New York, 1959. *$3.50.*

This volume, conceived to meet the lay person's need for reliable eye information, exposes dangerous misconceptions and replaces them with sound advice. Noteworthy examples include the importance of prompt ophthalmologic evaluation of children with strabismus; the need for routine medical examination of the eyes of patients over forty, with particular emphasis on the detection of glaucoma; and restatement of the limitations of optometrists, who are as qualified to render eye care as midwives are to provide prenatal and obstetrical care.

WILLIAM H. HAVENER, M.D.

Surgery of the Ear. By George E. Shambaugh, Jr., M.D. 669 pages. W. B. Saunders Co. Philadelphia, 1959, *$27.50.*

Dr. Shambaugh's long and extensive knowledge of diseases of the ear, and his acquaintance with leaders in otologic surgery has enabled him to write an authoritative work which has already been accepted as the outstanding text on aural surgery. On the basis of an excellent, very complete bibliography alone, this text belongs in every aural surgeon's library. It is recommended without hesitation to all otolaryngologists and other physicians interested in surgery of the ear.

WILLIAM H. SAUNDERS, M.D.